

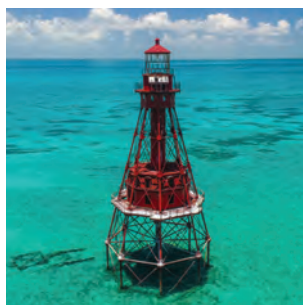
Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration

FLORIDA KEYS NATIONAL MARINE SANCTUARY



Draft Environmental Impact Statement for FLORIDA KEYS NATIONAL MARINE SANCTUARY:

A RESTORATION BLUEPRINT



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Cover photos (left to right, from top): coral cover at Tortugas Ecological Reserve; recreational fishing; sand flats in the backcountry; American Shoal lighthouse; shipwreck of the *City of Washington*; recreational boating

Cover photo credits (left to right, from top): Greg McFall/NOAA; Matt McIntosh/NOAA; Shawn Verne; Shawn Verne; David Ruck/NOAA; Gena Parsons/NOAA

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ABSTRACT

The National Oceanic and Atmospheric Administration's (NOAA) Office of National Marine Sanctuaries (ONMS) proposes to expand the Florida Keys National Marine Sanctuary (FKNMS) boundary, update sanctuary-wide regulations, modify and establish new marine zones, update marine zone specific regulations, and revise the sanctuary's non-regulatory management plan. The purpose of this proposal is to meet the purposes and policies of the National Marine Sanctuaries Act (NMSA; 16 U.S.C. § 1434(a)(4)), to implement specific actions identified in the 2007 FKNMS management plan, and to act upon several recommendations of the FKNMS Sanctuary Advisory Council. These recommendations are based primarily on the 2011 FKNMS condition report. The need for this proposal is based on widespread, acute, chronic, and emerging threats to marine resources in the Florida Keys. The existing regulations, marine zones, and management plan activities designed and implemented by FKNMS in the mid 1990s are no longer sufficient to ensure long-term resource protection and ecosystem function integrity into the future considering those threats.

NOAA prepared this DEIS in accordance with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. §§ 4321 *et seq.*) as implemented by the Council on Environmental Quality's regulations (40 C.F.R. Parts 1500-1508), and NOAA Administrative Order (NAO) 216-6A and Companion Manual, which describe NOAA policies, requirements, and procedures for implementing NEPA. The DEIS also fulfills the mandate of NMSA 16 U.S.C. § 1434(a)(4), which requires that "terms of designation may be modified only by the same procedures by which the original designation is made."

Lead agency: National Oceanic and Atmospheric Administration

Cooperating agency: U.S. Fish and Wildlife Service

For further information, contact: Beth Dieveney, policy advisor, Florida Keys National Marine Sanctuary, at (305) 797-6818 or beth.dieveney@noaa.gov

Comments due: January 31, 2020

To submit public comments online: Visit the federal eRulemaking portal at www.regulations.gov. In the search window, type NOAA-NOS-2019-0094, click the "Comment Now!" icon.

Public comments may also be submitted by mail to:

Sarah Fangman
Superintendent
Florida Keys National Marine Sanctuary
33 East Quay Road
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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE

Office of National Marine Sanctuaries
1305 East-West Highway
Silver Spring, Maryland 20910

Dear Reviewer:

In accordance with the provisions of the National Environmental Policy Act (NEPA), we enclose for your review the National Oceanic and Atmospheric Administration (NOAA) Office of National Marine Sanctuaries (ONMS) draft environmental impact statement (DEIS) and draft management plan (DMP) for the boundary expansion and marine zone and regulatory update of Florida Keys National Marine Sanctuary (FKNMS or sanctuary).

This document was prepared pursuant to the requirements of the National Marine Sanctuaries Act (NMSA) and NEPA to assess the environmental impacts and resource management strategies associated with NOAA expanding the sanctuary, developing revised regulations, and modifying and proposing new marine zones with associated regulations. Sanctuary expansion requires changes to the boundary description in the terms of the sanctuary designation. The NMSA requires that NOAA prepare an environmental impact statement for changes to the terms of designation, regardless of the significance of the impacts of the proposed action. This document announces the availability of the DEIS, including the revised management plan, for public comment. NOAA has been coordinating with the Florida State Historic Preservation Office and the Advisory Council on Historic Preservation to review and update FKNMS' expired Section 106 programmatic agreement. During the public comment period for this DEIS, NOAA is also seeking public comment on the draft programmatic agreement, available in Appendix C.

Comments will be accepted until January 31, 2020, and should be submitted electronically via the Federal e-Rulemaking Portal. Go to www.regulations.gov, search for docket NOAA-NOS-2019-0094, click the "Comment Now!" icon, complete the required fields, and enter or attach your comments. Written comments may also be directed to the sanctuary official identified below.

Sanctuary official: Sarah Fangman, Superintendent
Florida Keys National Marine Sanctuary
33 East Quay Road
Key West, FL 33040

Responsible official: John Armor, Director
Office of National Marine Sanctuaries

Sincerely,



John Armor
Director



ABOUT THIS DOCUMENT

This draft environmental impact statement (DEIS) provides detailed information and analysis of a range of reasonable alternatives for (1) changing the sanctuary boundary, (2) updating sanctuary-wide regulations, (3) modifying existing and creating new marine zones, (4) updating marine zone-specific regulations, and (5) updating the sanctuary management plan. This document includes analyses of the potential environmental, cultural, and socioeconomic impacts of the proposed action as well as several alternative changes that would affect the existing Florida Keys National Marine Sanctuary.

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

Accordingly, this document was preceded by a notice of intent (NOI) to prepare a DEIS and carry out a public scoping process (81 Fed. Reg. 879, April 19, 2012). The public scoping period commenced on April 19, 2012, and ended on June 29, 2012, during which time NOAA held five public meetings and received both written and oral comments. This document relies on the expertise, information, comments, and recommendations from the Sanctuary Advisory Council and its working groups, which met over a period of several months from January 2013 through October 2014. NOAA is the lead agency for this action. USFWS is a cooperating agency for this action.

Recommended Citation

Office of National Marine Sanctuaries. 2019. Draft environmental impact statement for Florida Keys National Marine Sanctuary: A Restoration Blueprint. 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 Florida Keys National Marine Sanctuary including Florida Keys superintendent Sarah Fangman, Andy Bruckner, Joanne Delaney, Beth Dieveney, Matthew Lawrence, and Stephen Wernkli. It was further prepared and reviewed by several ONMS headquarters staff including Eric Buck, Bob Leeworthy, Ed Lindelof, Dayna Rignanese, Michelle Rome, Danielle Schwarzmann, Sarah Stein, Vicki Wedell, Elizabeth Weinberg, and Lauren Wenzel; by several National Ocean Service staff including Giannina DiMaio and Shawn Choy; and by Jackie Rolleri of NOAA's Office of the General Counsel. Environmental data were compiled and analyzed by Christine Addison, Dan Dorfman, Chris Jeffrey, Angela Orthmeyer, and Shay Viehman of NOAA's National Centers for Coastal Ocean Science (NCCOS). Maps of the expansion boundary alternatives and marine zones were created by Amy Frietag of NCCOS and Tony Reyer of ONMS. The interactive mapping tool was created by Mimi D'Iorio of ONMS. Additional scientific data were provided by NOAA's National Marine Fisheries Service and Florida's Fish and Wildlife Conservation Commission's Fish and Wildlife Research Institute. The proposal for updates to Florida Keys National Marine Sanctuary was initiated and developed over several years by Florida Keys National Marine Sanctuary staff and most directed by the Florida Keys National Marine Sanctuary Advisory Council. This dedicated group consists of commercial and recreational fishermen, divers, maritime archaeologists, scientists, tourism and conservation interests,

and others (see floridakeys.noaa.gov/sac/members.html for more information). The advisory council received additional public input from four issue-specific community working groups that the advisory council established to further support this effort (see floridakeys.noaa.gov/review/workgroups.html for more information).

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GLOSSARY OF ABBREVIATIONS AND ACRONYMS

- ACHP – Advisory Council on Historic Preservation
- AOML – NOAA Atlantic Oceanographic and Meteorological Laboratory
- APE – area of potential effects
- ASA – Abandoned Shipwreck Act
- ATBA – area to be avoided
- ATON – aid to navigation
- Backcountry Management Plan – 1992 Management Agreement for Submerged Lands within the Boundaries of the Key West and Great White Heron National Wildlife Refuges
- BOEM – Bureau of Ocean Energy Management
- CA – conservation area
- CaCO₃ – calcium carbonate
- CCA – crustose coralline algae
- CCP – comprehensive conservation plan
- CEPP – Central Everglades Planning Project
- CEQ – Council on Environmental Quality
- CERP – Comprehensive Everglades Restoration Plan
- CERCLA – Comprehensive Environmental Response, Compensation and Liability Act
- CFR – Code of Federal Regulations
- C-MAN – NOAA’s Coastal Marine Automated Network
- CO₂ – carbon dioxide
- CO₃²⁻ – carbonate ion
- C-OCEAN – Community-Based Observations of Coastal Ecosystems and Assessment Network
- CREMP – Coral Reef Evaluation and Monitoring Program
- CWA – Federal Water Pollution Control Act, commonly referred to as the Clean Water Act
- CZMA – Coastal Zone Management Act
- DARRP – Damage Assessment Remediation and Restoration Program
- DEIS – draft environmental impact statement
- DEP – Florida Department of Environmental Protection
- DHR – Florida Department of State Division of Historical Resources
- DIN – dissolved inorganic nitrogen
- DMP – draft management plan
- DO – dissolved oxygen
- DOI – U.S. Department of the Interior
- ECOS IPaC – USFWS Environmental Conservation Online System (ECOS) Information for Planning and Conservation (IPaC) tool
- EFH – Essential Fish Habitat

EIS – environmental impact statement
EMA – existing management area
EPA – U.S. Environmental Protection Agency
ER – ecological reserve
ESA – Endangered Species Act
FDACS – Florida Department of Agriculture and Consumer Services
FEMA – Federal Emergency Management Agency
FKNMS – Florida Keys National Marine Sanctuary
FKNMSPA – Florida Keys National Marine Sanctuary and Protection Act
FMP – fishery management plan
FMSF – Florida Master Site File
FNAI – Florida Natural Areas Site Inventory
FRRP – Florida Reef Resilience Program
FWC – Florida Fish and Wildlife Conservation Commission
FWRI – FWC Fish and Wildlife Research Institute
FWPCA – *see* CWA
GMFMC – Gulf of Mexico Fishery Management Council
GPS – Global Positioning System
HAPC – habitat area of particular concern
HMS – highly migratory species
IMO – International Maritime Organization
MAP-CO₂ – moored autonomous pCO₂ buoy
MARPOL 73/78 – International Convention for the Prevention of Pollution by Ships
MBON – Marine Biological Observation Network
MBTA – Migratory Bird Treaty Act of 1918
MMPA – Marine Mammal Protection Act
MP – management plan
MPA – marine protected area
MSA – Magnuson-Stevens Fishery Conservation and Management Act
NAAQS – National Ambient Air Quality Standards
NAICS – North American Industry Classification System
NCCOS – NOAA’s National Centers for Coastal Ocean Science
NEPA – National Environmental Policy Act
NHPA – National Historic Preservation Act of 1966
NMFS – NOAA’s National Marine Fisheries Service
NMSA – National Marine Sanctuaries Act

NOAA – National Oceanic and Atmospheric Administration
NOI – notice of intent
NOS – NOAA’s National Ocean Service
NPDES – National Pollutant Discharge Elimination System
NRHP – National Register of Historic Places
NPS – National Park System
OCS – Outer Continental Shelf
OFW – Outstanding Florida Waters
ONMS – NOAA’s Office of National Marine Sanctuaries
Programmatic Agreement – Programmatic Agreement for the Purpose of Historical Resource Management in the Florida Keys National Marine Sanctuary
PEA – programmatic environmental assessment. *Specifically refers to the* Programmatic Environmental Assessment for Field Operations in the Southeast and Gulf of Mexico National Marine Sanctuaries (NOAA 2018b)
PSSA – particularly sensitive sea area
PWC – personal watercraft
REEF – Reef Environmental Education Foundation
Refuge Complex – USFWS Florida Keys National Wildlife Refuge Complex
Refuge Improvement Act – National Wildlife Refuge System Administration Act of 1966
RFA – Regulatory Flexibility Act
ROGO – Rate of Growth Ordinance
RVC – Florida Keys Reef Visual Census
SAFMC – South Atlantic Fishery Management Council
SCREAM – Sanctuary Coral Reef Ecosystem Assessment and Monitoring Program
SCTLD – stony coral tissue loss disease
SEAKEYS – Sustained Ecological Research Related to Management of the Florida Keys Seascape
SFWMD – South Florida Water Management District
SHPO – Florida State Historic Preservation Office; *also refers to* state historic preservation officer
SPA – sanctuary preservation area
SPL – Saltwater Products License
SPARC – Spatial Analysis and Resource Characterization Tool
SUA – special use research only areas
TDC – Monroe County Tourist Development Council
TN – total nitrogen
TOC – total organic carbon
TP – total phosphorus
THPO – tribal historic preservation officer

Glossary of abbreviations and acronyms

USACE – U.S. Army Corps of Engineers
USCG – U.S. Coast Guard
USFWS – U.S. Fish and Wildlife Service
WMA – wildlife management area
WQPP – Water Quality Protection Program
WRDA – Water Resources Development Act

EXECUTIVE SUMMARY

Background, purpose, and need

Following the principles and processes set forth in the National Marine Sanctuaries Act (NMSA, 16 U.S.C. §§ 1431 *et seq.*), Florida Keys National Marine Sanctuary (FKNMS) developed this draft environmental impact statement (DEIS) to evaluate the impacts to the human and ecological environment from a variety of management measures that would further the existing sanctuary management in a comprehensive effort to protect the ecosystem and maintain the vibrant quality of life and economies of the Florida Keys. This DEIS considers various alternatives to help counteract the decline in resource condition in the Florida Keys through a series of regulatory and management measures designed to reduce threats and, where appropriate, restore coral reefs, seagrasses, and other important habitats.

On November 16, 1990, Congress designated FKNMS. The sanctuary encompasses 3,800 square miles. It spans a shallow water interface between the Gulf of Mexico and the Atlantic Ocean, and is adjacent to most of the relatively shallow estuarine waters of South Florida, including those of Florida Bay and Biscayne Bay. FKNMS surrounds more than 1,700 islands, which constitute most of the limestone island archipelago of the Florida Keys. This archipelago extends from the Florida peninsula south and west over 220 miles (354 km), terminating at the islands of Dry Tortugas National Park. The oceanic boundary of FKNMS is the 300-foot isobath (~100-meter depth). FKNMS shares trusteeship of marine resources with the state of Florida, as 60 percent of the sanctuary falls within state waters.



Figure E-1. A large field of ESA-listed elkhorn coral supports critical habitat at Horseshoe Reef, one of the most diverse sites in the Upper Florida Keys. Photo: NOAA

FKNMS protects open ocean, offshore reef tract and nearshore patch reefs, seagrass meadows, hardbottom regions, and fringing mangroves. FKNMS waters and habitats support high species diversity due to the presence of both tropical and subtropical species, including the largest documented contiguous seagrass community in the Northern Hemisphere and extensive coral reef habitat. The sanctuary is also home to maritime heritage resources that encompass a broad historical period.

The Florida Keys are part of the much larger South Florida regional ecosystem, which possesses a wealth of natural resources while also facing major ecological challenges and restoration opportunities. The South Florida ecosystem supports unique and diverse habitats, including the seagrass beds of Florida Bay, mangrove swamps, the Everglades sawgrass prairies, and Florida Keys tropical hardwood hammocks, mangroves, and coral reefs.

The South Florida ecosystem has also been extensively altered through development of drainage canals completed to facilitate coastal development, agriculture, and flood control. These canals have significantly altered the distribution, timing, and quality of freshwater flow within the South Florida watershed, resulting in degraded marine habitats and other environmental changes that continue to impact the estuaries of Florida Bay and the environment of the Florida Keys.

Current management approach

Since establishing FKNMS, NOAA has taken several actions to protect and manage the marine resources within the Florida Keys. NOAA's current management of the sanctuary is based on its 1997 final environmental impact statement and a 2007 revised management plan. The 1997 environmental impact statement and management plan implemented sanctuary-wide regulations and established the nation's first comprehensive network of marine zones in FKNMS after years of planning, design, and public input. The FKNMS marine zones have differing levels of use and protection for each area and are designed to protect and preserve sensitive parts of the ecosystem while allowing activities that are compatible with resource protection. FKNMS marine zones include:

- Wildlife management areas (WMAs) that protect shallow water habitats and dependent wildlife,
- Sanctuary preservation areas (SPAs) that separate conflicting uses and protect the reef structure,
- Special use areas (SUAs) that support specific targeted activities such as research and restoration,
- Ecological reserves (ERs) that protect large contiguous habitats, and
- Existing management areas (EMAs) that provide for the continued management of areas that were established prior to sanctuary designation in 1997 and are subject to their own protections and restrictions in addition to sanctuary-wide regulations.

Since implementation of regulations and marine zones in 1997, NOAA updated FKNMS marine zone regulations to include the Tortugas Ecological Reserve in 2001; added a no-discharge zone regulation within federal waters in 2010 (Florida state waters were designated as no-discharge in 2002); and updated non-regulatory management plan activities in a 2007 revised management plan.

Effective management depends on knowledge of sanctuary marine resources, including their extent and status. Research and monitoring activities have been underway in the Florida Keys since the mid-1960s. However, since the designation of FKNMS, research and monitoring activities conducted by federal, state, and local agencies and academic and non-governmental organization partners have become much more coordinated and comprehensive. For example, long-term Water Quality Protection Program (WQPP) monitoring programs for water quality, seagrass, and coral reef extent and condition have been in place since 1995, and reef fish surveys have been conducted in the Florida Keys since the late 1970s. In addition, monitoring of coral and hardbottom benthic communities, including incidence of bleaching and disease, has been conducted since 1999 through the Sanctuary Coral Reef Ecosystem Assessment and Monitoring Program (SCREAM), now part of NOAA's National Coral Reef Monitoring Program. Coral communities have also been monitored since 2006 through the Florida Reef Resilience Program (FRRP). State and academic research partners conduct additional species and issue-specific research on spiny lobster, queen conch, several sponge species, stone crab, and a host of reef fish species.

Outcomes from some of the above research indicate management success in the Tortugas Ecological Reserve. For example, after 10 years of reserve protection, black grouper exhibited marked increases in population numbers and size when compared to black groupers in two nearby areas where fishing is

allowed: Dry Tortugas National Park and Tortugas Bank. Prior to reserve implementation in 2001, few black groupers in the area grew larger than the minimum legal size for harvesting. By 2008, the reserve had the greatest number of large grouper when compared to the two other areas. In addition, there is evidence that reserve protection helped restore the important reef fish spawning grounds at Riley’s Hump in the Tortugas South Ecological Reserve.

A mapping project conducted in 1995 and replicated in 2015 documented visible scarring and grounding impacts in shallow seagrass habitats from the northern boundary of the sanctuary to the west of Key West in the Marquesas Keys. While results from this study were striking because of the number of severely impacted acres – which jumped 285 percent from 1995 to 2015, from 5,060 acres to 19,462 acres – data also indicated the value of important management successes. For example, Figure E-1 shows impacts to seagrass beds at Tavernier Key in 1998 just as the sanctuary established the area as a no-motor wildlife management area. Aerial photos taken in 2014, 16 years after implementing the no-motor zone, show the value of this management tool in protecting these habitats. Much of the area has been restored to a healthy seagrass meadow. This is the type of successful management approach that can and should be applied to some of the other impacted seagrass areas to help restore and protect this important habitat.



Figure E-2. Aerial imagery of Tavernier Key before and after establishment of a no-motor wildlife management area. Photo: Krueer

Mooring buoys were first installed in 1981 in Key Largo as a means to reduce anchor damage to sensitive marine habitats, especially coral formations, seagrass beds, and submerged archaeological resources. Mooring buoys are an important management tool in FKNMS, providing boaters the ability to moor their vessels safely and avoid damaging coral reefs and other important ecosystems. FKNMS now maintains about 500 mooring buoys as part of an overall network of almost 800 buoys, which also includes boundary buoys that mark marine zones, wildlife management area boundary buoys, shoreline marker buoys, and information buoys.



Figure E-3. The sanctuary provides more than 400 mooring buoys to protect against anchor damage on the reef. Photo: Nancy Diersing/NOAA

Education and outreach efforts, designed to raise awareness and change behavior, connect science with sanctuary users in a variety of ways. The Blue Star program recognizes dive and snorkel operators and fishing guides who train staff and educate customers on ecologically-friendly practices. Research has demonstrated that customers diving with a Blue Star operator are 2.5 times less likely to contact the reef compared to divers with non-Blue Star operators (Camp 2009; Krieger and Chadwick 2012). A free, voluntary, sanctuary-specific boater education course instituted in April 2019 includes strategies for responsible boating and stewardship to reduce impacts. Following Hurricane Irma in 2017, the sanctuary created Goal: Clean Seas Florida Keys, an initiative to train and permit businesses, residents, and tourists to assist in removing marine debris in nearshore waters. As of July 2019, participants had collected more than 30,000 pounds of debris including traps and trapline.



Figure E-4. Florida Keys National Marine Sanctuary coordinates volunteers to remove marine debris from mangrove-fringed islands. Photo: Marlies Tumolo/NOAA

While there have been management successes in FKNMS, the need for the proposed action is based on widespread, acute, chronic, and emerging threats to marine resources and federal trust resources in the Florida Keys. The existing regulations, marine zones, and management plan activities designed and implemented by FKNMS in the mid-1990s are no longer sufficient to ensure long-term resource protection and ecosystem function into the future. This assessment is based primarily on the 2011 FKNMS condition report (NOAA 2011), which concluded that resources in the Florida Keys appeared to be in fair to fair/poor condition and are generally either stable or in decline, and that emerging threats to sanctuary resources include invasive species, climate change, and increasing coastal and visitor populations and recreational use of the sanctuary (see <https://sanctuaries.noaa.gov/science/condition/fknms/welcome.html> for the condition report summary and full document).

Since release of the 2011 condition report, sanctuary resources have been impacted by Hurricane Irma, a coral disease outbreak, and a seagrass die-off, among other threats (see Chapter 4 for details).

The quality of the marine environment and marine resource health of the Florida Keys are inextricable. A declining marine environment puts the economy and jobs at risk. Relying on the existence and maintenance of a healthy marine environment, the Florida Keys support more than 77,000 residents and approximately 5.5 million visitors, who collectively contribute to the \$4.7 billion economy (Key West Chamber of Commerce 2018). Approximately 60 percent of the economy is tied directly to marine-related

activities, including commercial and recreational fishing, boating, diving, wildlife viewing, and other various tourist-related activities.

Public engagement to date



Figure E-5. Public input was provided at scoping meetings throughout the Florida Keys, Miami, and Fort Myers in 2012. Photo: NOAA

On April 19, 2012, NOAA and the U.S. Department of the Interior’s (DOI) U.S. Fish and Wildlife Service (USFWS) – a cooperating agency for this DEIS – published a notice of intent in the Federal Register. The notice informed the public of the proposed action, announced five scoping meetings, and solicited public comment. ONMS and USFWS held public scoping meetings in Marathon on June 19, 2012; Key Largo on June 20, 2012; Key West on June 21, 2012; Miami on June 26, 2012; and Fort Myers on June 27, 2012. Several hundred people participated in these meetings and provided input on specific issues to be analyzed or addressed as part of the marine zoning and regulatory review (Figure 1.3).

In addition to public scoping meetings, ONMS and USFWS accepted written comments from April 19, 2012, to June 29, 2012. Comments were provided in emails, letters, faxes, and electronic submission on <http://www.regulations.gov>. A specific section on the FKNMS website (<http://floridakeys.noaa.gov/review/welcome.html>) serves as a central location for information on the proposed action. During the comment period, the agencies received over 500 comments. The website provides a summary document of all scoping comments (<http://floridakeys.noaa.gov/review/documents/scopingcommentssummary.pdf>) and a link (<http://www.regulations.gov/#!docketDetail;rpp=25;po=0;D=NOAA-NOS-2012-0061>) to access all of the scoping comments received.

As part of formal scoping, the Sanctuary Advisory Council played a significant leadership role throughout this review and the alternatives development process. The advisory council and three community working groups met over a period of 22 months – January 2012 through October 2014 – to review scientific and human use data and information, hear further public comment, and develop advice and recommendations for the sanctuary superintendent as well as the Florida Keys National Wildlife Refuge Complex manager to consider when developing alternatives related to marine zones within the sanctuary. A fourth community working group met for a two-day workshop in July 2015 to address artificial habitats, an advisory council priority issue not previously discussed by the initial three community working groups. More than 70 meetings were held (January 2013 through October 2014) throughout the Florida Keys for the advisory council and community working groups to develop recommendations for the sanctuary superintendent and refuge manager. More information and summary documents of the advisory council and working groups are at <https://floridakeys.noaa.gov/restoration>.

ONMS reviewed all of the scoping comments and Sanctuary Advisory Council input and considered such comments when developing the content and scope of this DEIS.

In addition to gathering public input during formal scoping, NOAA worked closely with and sought input from numerous pertinent resource agencies and researchers on the development of the DEIS. In addition, informal briefings with other NOAA offices, the Gulf of Mexico Fishery Management Council (GMFMC), the South Atlantic Fishery Management Council (SAFMC), and state of Florida partner agencies have been ongoing since initiation of the public scoping for this DEIS.

Summary of proposed action and alternatives

This DEIS includes four alternatives: Alternative 1 (no action); Alternative 2 (slightly more environmentally protective); Alternative 3 (preferred alternative, with many actions identical to Alternative 2 or progressively more environmentally protective); and Alternative 4 (many actions identical to alternatives 2 and 3 or progressively more environmentally protective). The alternatives build on each other. Alternatives 2, 3 and 4 all propose the same revised management plan. Alternatives 2 and 3 propose the same boundary changes and the same sanctuary-wide regulatory changes. See Table E.1.

Each alternative describes NOAA’s proposals for changes to five specific components of FKNMS management:

1. the sanctuary boundary;
2. sanctuary-wide regulations;
3. marine zone boundaries within the sanctuary;
4. marine zone regulations; and
5. changes to the sanctuary management plan.

A summary of the management plan and alternatives is included here.

Management plan. The draft revised management plan includes a vision and mission. It also includes goals and associated objectives and activities designed to facilitate understanding of sanctuary resource condition and value that are applied to target management actions, reduce impacts to resources, and enhance stewardship and collaboration.

Direct, long-term benefits to living marine and marine-dependent resources are the primary outcomes sought through the updated management plan activities. The management plan goals related to better understanding sanctuary resources (Goal 1), maintaining and improving sanctuary resources (Goal 2), and maintaining or increasing efforts to reduce threats to sanctuary resources (Goal 3) include the majority of activities intended to benefit sanctuary habitats and wildlife resources.

A sampling of proposed activities includes developing a sanctuary restoration plan; testing new ecological restoration approaches; facilitating recovery of ESA-listed coral species; evaluating fishing gear impacts to sanctuary resources and developing best management practices to mitigate impacts; and working with fishery management agency partners to further ecosystem-based management approaches and advance understanding and management of fish aggregation sites.

Several proposed management plan activities focus on understanding and addressing potential impacts to the sanctuary from climate change. These would include, but not be limited to, continued engagement with the Florida Reef Resilience Program, facilitating recovery of coral species listed under the Endangered Species Act (ESA), supporting targeted research activities, and advancing understanding and potential additional stewardship opportunities through education and outreach efforts.

The proposed management plan includes several activities related to sanctuary water quality, including strengthening engagement with the Water Quality Protection Program, engagement at the regional level with the South Florida Ecosystem Restoration Task Force, and targeting activities to better identify the sources and potential strategies to address water quality impacts.

There are also several activities focused on managing uses that may impact sanctuary resources and facilitate a strengthened stewardship ethic. These include, but are not limited to, implementing an updated marine zoning scheme, working with users to inform placement of mooring buoys, implementing a voluntary boater education course, and maintaining and enhancing the Blue Star programs.

Several proposed management plan activities focus on understanding and managing historical resources in the sanctuary. Those activities most notably include improving the inventory and characterization of historical resources, better understanding visitor use and mitigating potential impacts of that use, and implementing archaeological research standards through an updated permit category.

In general, updating the management plan would allow for a more coordinated and priority-driven effort and, as a result, would support more effective management and conservation-based outcomes.

Alternative 1: No action (status quo)

The no action alternative, Alternative 1, would maintain the existing sanctuary boundary, sanctuary-wide regulations, marine zones and associated regulations, and management plan. In short, under the no action alternative, NOAA would make no changes in the way the sanctuary would be managed. The sanctuary would continue to be managed within the current boundary, marine zones, regulations, and management plan.

Alternative 2

Alternative 2 proposes to reduce stressors and impacts to sanctuary and refuge resources. This alternative differs from the no action alternative in that NOAA would expand the boundary, update and add new

sanctuary-wide regulations, modify existing marine zones, and add new marine zones with regulations to increase protections, and update the management plan. Specifically, Alternative 2 would expand the boundary to 4,541 square miles to include the area to be avoided and encompass the area in the Tortugas region between the existing sanctuary boundary and the Tortugas South Ecological Reserve. Alternative 2 would add 31 wildlife management areas, six sanctuary preservation areas, and two areas as conservation areas for a total of eight conservation areas. In alternatives 2, 3, and 4, conservation area zone type would replace special use area and ecological reserve zone types.

Alternative 3 (NOAA’s preferred alternative)

Alternative 3 is the NOAA preferred alternative and, therefore is described in more detail here. NOAA designed Alternative 3 to create a balance between resource protection and sustainable use with a greater emphasis on resource protection than Alternative 2. Specifically, Alternative 3 would expand the boundary to 4,541 square miles to include the area to be avoided and encompass the area in the Tortugas region between the existing sanctuary boundary and the Tortugas South Ecological Reserve. This alternative would add 32 wildlife management areas, seven special use areas, and two conservation areas to the existing sanctuary.

Sanctuary-wide regulations. Alternative 3 includes the same proposed sanctuary-wide regulation changes as Alternative 2, including an updated emergency regulation, an updated historical resources permit category, and a new proposed regulation to address the threat posed by grounded and abandoned vessels. Highlights follow. For more details, see Chapter 3.

Updating the existing emergency regulation would strengthen the sanctuary’s ability to more rapidly and flexibly respond to threats and unforeseen impacts to sanctuary resources to prevent or minimize the destruction of, loss of, or injury to a sanctuary resource or quality, and would provide NOAA sufficient time to conduct the necessary review and public notice if a rulemaking process is deemed necessary. This update to existing regulations would be in direct response to the Sanctuary Advisory Council’s request that the sanctuary: (1) identify potential resource threats needing rapid management responses not available in the existing regulatory framework; (2) develop, modify, or insert regulatory language to better respond to management challenges or resource protection issues; (3) develop a research and monitoring component to feed adaptive management measures; and (4) allow greater flexibility in modifying zones to address changing resource management needs.

Updating the historical resources permitting process to align with those of the Florida Department of State Division of Historical Resources (DHR) would improve the quality and reporting of historical research projects undertaken in the sanctuary, further aiding NOAA with its conservation mandates and advancing interpretation of sanctuary historical resources for the public. This proposed update considers the sensitive, nonrenewable character of historical resources and the shared stewardship responsibilities vested in NOAA and DHR.

To address concerns regarding the potential threats to the marine environment from derelict or deserted vessels, and to require vessel owners to take care of deserted vessels before they become grounded and cause damage, NOAA would revise regulations to address this threat and provide additional authority to address derelict vessel debris and associated impacts. These new prohibitions and requirements would help reduce or avoid harm to FKNMS resources from derelict vessels as a result of direct impacts from the settling or colliding of a vessel on habitats and potential leakage of hazardous or harmful matter from

a vessel. NOAA would be better positioned to enforce removal of deserted vessels to prevent potential groundings, collisions, or discharge of harmful materials that could harm FKNMS resources.

Marine zones and associated regulations. Alternative 3 includes proposed modified and new marine zones to provide additional targeted, site-specific protection where resource damage is evident. Specific marine zone regulations and access restrictions proposed in Alternative 3 allow a more resource protective strategy than those proposed in Alternative 2 and are less restrictive than those proposed in Alternative 4, which is the most resource-protective alternative proposed. Alternative 3 includes wildlife management areas, sanctuary preservation areas, conservation areas (which would replace the existing “ecological reserve” and “special use area” zone names), and management areas (which would replace the current “existing management area” zone name).

Alternative 3 would protect habitats through additional proposed marine zones and through proposed regulations applied in those marine zones. New habitat types protected in the proposed marine zones for Alternative 3 include hardbottom, shallow bank reefs, and patch reefs, and deep offshore reefs. Marine zones would also protect wildlife and ecological processes. These marine zones aim to support roosting, nesting, and foraging birds; nesting and foraging sea turtles; juvenile fish; fish spawning aggregations; coral species protected under the ESA; and other wildlife species. Alternative 3 includes marine zones that are intended to protect a range of habitat types that support the full range of needs throughout a species’ life cycle.

The proposed marine zone regulations in Alternative 3 would reduce overuse of sanctuary resources and limit habitat degradation from prop scarring, anchor damage, and impacts to wildlife species such as flushing nesting and roosting birds. Under Alternative 3, wildlife management area regulations would be specific to the resource protection goals for each wildlife management area and include idle speed/no-wake, no-motor, no-anchor, trolling only, and no entry. Sanctuary preservation area regulations would be updated such that regulations would be consistent within every sanctuary preservation area. To achieve this, the existing practice of issuing baitfish permits in all sanctuary preservation areas and allowing catch and release fishing by trolling in four sanctuary preservation areas (Conch Reef, Alligator Reef, Sombrero Reef, and Sand Key) would be eliminated. Additional idle speed and no-anchor regulations would be implemented in all sanctuary preservation areas as safeguards against potential vessel grounding events, to further the original intent to separate conflicting uses through an additional public safety measure, and provide additional habitat protection. Regulations for conservation areas, the most protective zone type, would maintain the existing transit-only regulation (this is no change from Alternative 1 [no action alternative] regulations applied in ecological reserves and special use areas).

Below is a description of some of the proposed modified and new marine zones included in Alternative 3. (Note: some of these may also be included in alternatives 2 and 4; see Section 3.6 for a comparison of marine zones across alternatives.) The below zones are highlighted to demonstrate how marine zones in Alternative 3 are used to protect additional habitat types (e.g., patch reefs, hardbottom), habitats essential for wildlife (e.g., foraging birds and sea turtles), fish spawning sites, sites with remaining or historical presence of ESA-listed coral species, and sites to facilitate habitat restoration, among others.

The proposed new wildlife management area at Western Dry Rocks would directly benefit habitats and wildlife, particularly fish species, that use this area for spawning. The trolling-only regulation proposed at this site would benefit fish because spawning fish are not likely to be taken while trolling.

The proposed new speed-restricted Marquesas Keys Turtle Wildlife Management Area would provide significant direct beneficial impacts to seagrass habitats that are recognized as internationally important foraging areas for green sea turtles. Enacting speed restrictions would reduce adverse impacts to seagrass habitats and foraging areas by decreasing the risk of propeller-related damage.

Several proposed new no-motor zones would be implemented within the Florida Keys Wildlife Refuge Complex. These no-motor zones would provide direct beneficial impacts to bird species that use these areas for nesting, roosting, and/or foraging. These proposed zones would also have direct beneficial impacts on shallow water habitat and associated wildlife and mangroves where the marine zone encompasses a mangrove island, because the new zone would prevent scarring and other disturbances that could result from boating traffic.

The existing Key Largo Dry Rocks and Grecian Rocks sanctuary preservation areas would be combined and expanded to include an area at North Dry Rocks that would protect an area containing one of the largest remaining healthy populations of ESA-listed star corals on outer reefs in the Upper Keys. This action to expand regulatory protections to these habitats would have a direct beneficial impact on these reef habitats and associated wildlife, particularly furthering the protection of threatened star corals present in these areas.

Turtle Rocks and Turtle Shoals would be added as new sanctuary preservation areas to protect patch reef coral habitats, which are not well represented in the current marine zoning scheme. This action would have a direct beneficial impact on these reef habitats and associated wildlife by reducing or minimizing potential adverse impacts associated with human use of these sensitive areas. Additionally, ONMS would propose protections at Turtle Rocks that would enhance the no lobster trap gear regulations implemented at this site by the John Pennekamp Coral Reef State Park.

The existing Western Sambo Ecological Reserve would be included in Alternative 3 as a sanctuary preservation area and continue to allow the current level of access to this area. In Alternative 3, ONMS would also expand Western Sambo seaward to include additional deep reef habitat known to be important for the spiny lobster life cycle. This proposed expansion would provide direct beneficial impacts for these deeper reef habitats and associated wildlife by protecting important habitat for spiny lobster from adverse impacts of human use of this area, such as anchor damage and fishing gear.

The Tortugas corridor in the Tortugas region would become a new sanctuary preservation area under Alternative 3. This area is known to serve as a transit corridor between Tortugas Ecological Reserve South and Dry Tortugas National Park for spawning fish. This proposed new zone would provide direct beneficial impacts by protecting the fish species transiting through this area from human disturbance.

Alternative 3 also includes proposed sanctuary preservation areas targeted for ecosystem restoration which would provide benefits to both resources within these areas and to advancing research and understanding of restoration techniques. These sites would include Pickles Reef, Marathon, Delta Shoals, and Key West sanctuary preservation areas. These areas are currently active coral reef nursery and/or restoration sites. By creating marine zones at these sites and applying sanctuary preservation area regulations, the nursery coral would be protected from anchor damage and potential impacts from fishing gear, while also allowing the public to access and learn about coral restoration efforts. These proposed new zones would provide direct beneficial impacts to the habitats and coral nursery sites.

The proposed new sanctuary preservation area adjacent to Long Key State Park and extending to the deep reef at Tennessee Reef would protect large, contiguous, interconnected seagrass, shallow hardbottom, aggregate patch reef, and deep, drowned spur-and-groove reef habitats. This sanctuary preservation area would also provide a corridor for migration of different life stages of fishes from Florida Bay into the Middle Keys. Protection of this area and application of existing and proposed new sanctuary preservation area regulations would have a direct beneficial impact on the habitats and associated wildlife in this area by avoiding potential adverse impacts to biological resources associated with human use of this area, including anchoring.

Alternative 3 would include implementation of a pilot limited-use program at three sanctuary preservation areas (Carysfort, Sombrero, and Sand Key). This would provide direct beneficial impact to resources in these areas from a decreased level of concentrated and overall use. Easy access to recreational sites in the Florida Keys has increased the burden on numerous habitats and the species with which they are associated. Implementing the limited use sanctuary preservation areas proposed in this alternative would also provide indirect beneficial impacts to biological resources by increasing the information available to assess carrying capacity in sensitive areas and associated wildlife disturbances, impacts to species diversity, abundance, and distribution, as well as direct impacts of overuse.

Channel Key Bank and Red Bay Bank would become two new conservation areas designed to protect hardbottom and bank habitats, both of which are not well represented in the current zoning scheme. Managing these new areas as conservation areas would have a direct beneficial impact on the associated habitats and wildlife in this area by minimizing the interactions between human use and wildlife and facilitating continued research and restoration activities in these areas. These proposed conservation areas are associated with other new idle speed/no-wake wildlife management areas proposed in Alternative 3 that are intended to address impacts to benthic habitats and associated wildlife from vessel prop scarring.

Tortugas South Conservation Area would expand to encompass additional area to the west of the existing marine zone boundary that includes ecological features associated with Riley's Hump and is known to support multi-species fish spawning aggregations. This proposed modification would have a direct beneficial impact on the associated habitats and wildlife using this area through the additional spatial protections and applications of conservation area regulations.

Management plan. A revised management plan is included in Alternative 3, which is the same as is the management plan included in alternatives 2 and 4. A brief summary is included above.

Alternative 4

Alternative 4 is primarily designed to protect large contiguous habitats and includes the most protective regulations within individual marine zones. Specifically, Alternative 4 would expand the boundary to include a distinct unit at Pulley Ridge for a total of 4,800 square miles and would add 31 wildlife management areas, three sanctuary preservation areas, and seven conservation areas.

Alternative 4 includes the same proposed sanctuary-wide regulation changes as proposed for alternatives 2 and 3. It would update two existing regulations: one designed to provide additional protection to all shorelines in the sanctuary, and one to provide FKNMS with additional permitting authority over live rock aquaculture activities to manage potential impacts to sanctuary resources. Alternative 4 includes the same proposed updated management plan as proposed for alternatives 2 and 3.

Alternative 4 strives to meet a balance between protection of targeted site-specific locations where resource damage is evident while also providing protection of the largest area of contiguous habitats compared to the other alternatives. This approach aims to more fully meet Goal 2 of the Sanctuary Advisory Council’s regulatory and zoning alternatives development workplan: “Protect large, contiguous, diverse, and interconnected habitats that provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life and protect and preserve all habitats and species.” The marine-zone-specific regulations and access restrictions would be more protective in Alternative 4 than in any of the other proposed alternatives.

Table E-1. Summary of five management components within each alternative (areas are approximate)

Components	Alternatives			
	Alternative 1 (no action)	Alternative 2	Alternative 3 (preferred)	Alternative 4
Sanctuary boundary	Alt. 1 (no action) 3,800 sq. miles	Existing boundary Area to be avoided (ATBA) Tortugas Region 4,541 sq. miles	Existing Boundary ATBA Tortugas Region 4,541 sq. miles	Existing Boundary ATBA Tortugas Region Pulley Ridge 4,800 sq. miles
Sanctuary-wide regulations	Alt. 1 (no action)	Update 3 existing Proposed 4 new	Update 4 existing Propose 4 new	Update 5 existing Propose 4 new
Marine zone boundaries¹	Alt. 1 (no action) 57 total zones 1033 sq miles	96 total zones 1129 sq miles	98 total zones 1141 sq miles	98 total zones 1433 sq miles ²
Additional marine zone regulations	Alt. 1 (no action)	Eliminate 2 exceptions Update 2 existing Apply more protective regulations than Alt. 1	Same as Alt. 2 or more protective (e.g., greater number of no-entry areas)	same as alt. 2 and 3, or more protective (e.g., greater number of transit- only areas)
Management plan	Alt. 1 (no action)	New proposed management plan	Same as Alt. 2	Same as Alt. 2

1. The total marine zone counts and areas include Great White Heron and Key West National Wildlife Refuges existing management areas.
2. The area estimate includes the boundary expansion at Pulley Ridge due to the application of a proposed no-anchor regulation.

Comparison of impacts across alternatives

There are environmental tradeoffs among the alternatives and within resource issue areas or topics, making it difficult to summarize the net effect of the alternatives. Overall, all of the action alternatives would result in beneficial impacts in one or more environmental issue areas, and none of the action alternatives would result in a significant adverse impact.

The analyses below in tables E-2 and E-3 demonstrate the scale of the increasing protection of sanctuary area and area protected within marine zones from Alternative 2 to Alternative 4. Alternatives 2, 3, and 4 include expansion in overall area of the sanctuary and the addition of the area to be avoided and Tortugas. Alternative 4 also includes the addition of the Pulley Ridge expansion area. The size of marine zone protection across alternatives (Table E-2) further indicates increased ecological protection of habitats among action alternatives, where Alternative 2 protects 1,129 square miles in marine zones, Alternative 3

protects 1,141 square miles in marine zones, and Alternative 4 protects 1,433 square miles in marine zones. In the economic comparison across alternatives (Table E-4), each category experiences a stepwise increase net economic benefit with increasing environmental protection. For example, ONMS estimated the net benefit for person-days of visitation and recreation in the sanctuary would be 133,014 for Alternative 2, 159,568 for Alternative 3, and 923,823 for Alternative 4. The benefits for Alternative 4 estimated here represent the maximum potential benefits from non-consumptive recreation (i.e., scuba, snorkeling, and wildlife viewing) that could accrue in the long run as a result of protecting Pulley Ridge. For more details on the short-term benefits see Leeworthy et al. 2019.

The analysis of the environmental consequences of each of the alternatives shows that no single alternative is the environmentally preferred alternative. Rather, all of the action alternatives are environmentally preferable because they would result in beneficial impacts (i.e., protect biological, physical, cultural, and socioeconomic resources), and none of the action alternatives would result in significant adverse impacts. Although Alternative 4 is the most environmentally protective and would protect the greatest total area, it would also experience negligible adverse impacts over a larger area than alternatives 2 and 3. Alternative 2, on the other hand, would protect fewer marine zones than alternatives 3 or 4, but would also experience negligible adverse impacts over a smaller area than alternatives 3 or 4. Therefore, there is not a single most environmentally preferable alternative.

Comparison of proposed sanctuary boundary alternatives

Table E-2. Boundary expansions in FKNMS by alternative (square miles)

Alternatives	Total area	Expansion area	ATBA expansion	Tortugas expansion	Pulley Ridge ¹
1 - no action	3,800	0	0	0	0
2	4,541	743	472	271	0
3 - preferred	4,541	743	472	271	0
4	4,800	1,002	472	271	259

1. Pulley Ridge comprises two habitat areas of particular concern (HAPCs). Pulley Ridge South is 214 square miles and Pulley Ridge South Portion A is 199 square miles. Both areas protect corals. Portion A was proposed by Final Amendment 9 to the Fishery Management Plan for Coral and Coral Reefs of the Gulf of Mexico, U.S. Waters (Gulf of Mexico Fishery Management Councils 2018).

Comparison of proposed marine zone alternatives

Table E-3. Number and size of marine zones by type of zone and regulatory alternative

Alternatives	Sanctuary boundary (sq. miles)	Total zoned (sq. miles) ¹	Additional zoned area (percent)	Number of WMAs ²	Number of SPAs ³	Number of ER/SUA /CA ^{4,5,6}	Number of EMA/MA ⁷	Total marine zones
1 - no action	3,800	1,033	0.00	28	19	6	4	57
2	4,541	1,129	9.29	59	25	8	4	96

3 - preferred	4,541	1,141	10.45	60	26	8	4	98
4	4,800	1,433	44.24	59	22	13	4	98

1. Includes area included in national wildlife refuges
2. Wildlife management areas
3. Sanctuary preservation areas, no-take areas
4. Ecological reserves, no-take areas
5. Special use areas, set aside for restoration or research only
6. ERs and SUAs changed to conservation areas in alternatives 2, 3, and 4
7. Existing management areas and management areas, includes national wildlife refuges

Table E-4. Comparison of socioeconomic benefits across the action alternatives. The no action alternative (Alternative 1) was not included because there would be no changes to economic indices under the no action alternative.

Impacts	Alternative 2	Alternative 3	Alternative 4³
Beneficial impacts¹			
Increase in number of person-days	211,822	238,376	1,009,164
Increased spending in direct expenditures (e.g., tour companies)	\$30,379,894	\$34,109,399	\$144,401,762
Increased spending within Monroe County (sales/output)	\$34,025,481	\$38,202,527	\$161,729,974
Increased income within Monroe County (jobs)	\$14,914,158	\$16,744,129	\$70,886,096
Increased number of jobs	420.6	472.2	1,999.1
Adverse impacts²			
Lost fishing revenue	\$585,216	\$585,216	\$813,989
Lost number of person-days	78,808	78,808	85,341
Decreased spending in direct expenditures (e.g., tour companies)	\$13,032,120	\$13,032,120	\$14,080,871
Decreased spending within Monroe County (sales/output)	\$15,643,739	\$15,643,739	\$17,234,784
Decreased income within Monroe County (jobs)	\$7,426,263	\$7,426,263	\$8,226,394
Decreased number of jobs	55.7	55.7	223.6
Net benefits			
Number of person-days	133,014	159,568	923,823
Spending in direct expenditures (e.g., tour companies)	\$17,347,773	\$21,077,278	\$130,320,891
Spending within Monroe County (sales/output)	\$18,381,743	\$22,558,788	\$144,495,190

Income within Monroe County (jobs)	\$7,487,895	\$9,317,866	\$62,659,702
Number of jobs	364.9	416.5	1,775.5

1. All of the beneficial impacts are due to increases in non-consumptive recreation.
2. All of the adverse impacts are due to losses to recreational and commercial fishermen.
3. The benefits for Alternative 4 estimated here represent the maximum potential benefits from non-consumptive recreation (i.e., scuba, snorkeling, and wildlife viewing) that could accrue in the long run as a result of protecting Pulley Ridge. For more details on the short-term benefits see Leeworthy et al. 2019.

Next steps

The next step is to widely circulate the DEIS and to solicit public comments on this document. Comments will be accepted until January 31, 2020, and should be submitted electronically via the federal e-Rulemaking Portal. Go to www.regulations.gov, search for docket NOAA-NOS-2019-0094, click the “Comment Now!” icon, complete the required fields, and enter or attach your comments. Written comments may also be directed to: Sarah Fangman, Superintendent, FKNMS, 33 East Quay Rd., Key West, FL, 33040. A full list of public meetings is available at floridakeys.noaa.gov.

During the public comment period, comments are anticipated from federal, state, and local agencies and officials; from organizations; and from interested individuals. These comments will be publicly available for viewing on regulations.gov. After the public comment period ends, a summary of these comments will be posted on the FKNMS website.

Following the DEIS review and consideration of public comments, NOAA will make any necessary changes to the preferred alternative/proposed action and issue a notice of proposed rulemaking. The notice of proposed rulemaking is the formal draft regulations needed to implement the preferred alternative. At this point, NOAA will provide another opportunity for public review and comment.

As part of the rulemaking process, formal consultation with the Gulf of Mexico Fishery Management Council and South Atlantic Fishery Management Council pursuant to Section 304(a)(5) of the NMSA will take place to update regulations for fishing and extend existing and updated fishing regulations to the expanded areas of the sanctuary. Consultation with other natural resource management agencies (e.g., USFWS, the National Marine Fisheries Service, and the U.S. Environmental Protection Agency) will also continue after the publication of the DEIS.

If NOAA moves forward with a final action, a final environmental impact statement and notice of final rulemaking would be published. The final rule would establish the final set of regulations for the sanctuary.

CHAPTER 1

INTRODUCTION AND BACKGROUND

1.1 Summary of the proposed action

This draft environmental impact statement (DEIS) includes a proposed action with various components that would help counteract the decline in resource condition in the Florida Keys through a series of regulatory and management measures designed to reduce threats and, where appropriate, restore coral reefs, seagrasses, and other important habitats. Following the principles and processes set forth in the National Marine Sanctuaries Act ((NMSA), 16 U.S.C. §§ 1431 *et seq.*), this DEIS evaluates the impacts to the human and ecological environment under a variety of management measures that would further the existing management in a comprehensive effort to protect the ecosystem and to maintain the vibrant quality of life and economies of the Florida Keys.

As the lead agency for this federal action, NOAA proposes to: expand the boundary of the sanctuary, update sanctuary-wide regulations, update the individual marine zones and their associated regulations, and revise the sanctuary management plan. In preparing this DEIS, NOAA worked closely with the U.S. Fish and Wildlife Service (USFWS), a cooperating agency that manages the USFWS Florida Keys National Wildlife Refuge Complex (Refuge Complex) areas that overlap portions of Florida Keys National Marine Sanctuary (FKNMS). This action and associated alternatives are described in more detail in Chapter 3.

1.1.1 Historical context for the proposed actions

Designated in 1990, FKNMS is the ninth national marine sanctuary to be established in a system that comprises 13 sanctuaries and two marine national monuments. Currently, as one of the largest marine protected areas in the United States, the sanctuary protects approximately 3,800 square miles of coastal and ocean waters from the estuarine waters of South Florida along the Florida Keys archipelago, encompassing more than 1,700 islands, out to Dry Tortugas National Park.

The mission of the sanctuary is to protect the marine resources of the Florida Keys while facilitating human uses that are consistent with the primary objective of sanctuary resource protection. Through continued science-based management, FKNMS endeavors to sustain high-quality environmental and socioeconomic resources for current and future generations. The Florida Keys support more than 77,000 residents and approximately 5.5 million visitors, who collectively contribute to the \$4.7 billion economy (Key West Chamber of Commerce, 2018) relying on the existence and maintenance of a healthy marine environment. The ecosystems of FKNMS provide habitats for more than 6,000 species of fishes, invertebrates, and plants in addition to uniquely expansive and diverse seagrass and coral reef communities. These resources are under increasing threat from high levels of use, coral disease, and climate change.

The Florida Keys have a long history of natural resource protection beginning in 1908 with the creation of Key West National Wildlife Refuge, followed by the 1938 establishment of Great White Heron National Wildlife Refuge. These refuges were established to protect colonial nesting and migratory birds including the great white heron and other wildlife from the impacts of plume hunting to support the millinery trade. In 1975, all of the islands within Key West National Wildlife Refuge with the exception of Ballast Key

were designated as part of the National Wilderness Preservation System, which limits human use and influence in order to preserve the quality, character, and integrity of these protected wilderness lands. The first undersea marine park, John Pennekamp Coral Reef State Park, was established in 1960 followed by Key Largo National Marine Sanctuary in 1975 and Looe Key National Marine Sanctuary in 1981.

Following several large vessel groundings impacting off-shore coral reefs, the identification of potential oil and gas exploration and drilling in Florida's coastal waters, environmental damage to Florida Bay and seagrasses, and public interest in protecting the Florida Keys resources, FKNMS was designated by Congress in 1990 through the Florida Keys National Marine Sanctuary and Protection Act (FKNMSPA). The act also established the Water Quality Protection Program (WQPP) that provides recommendations to the sanctuary, Florida Department of Environmental Protection (DEP), and the U.S. Environmental Protection Agency (EPA) on how to maintain and restore water quality of the Florida Keys. The FKNMS boundary is contiguous with three national parks, and within the sanctuary boundary are four national wildlife refuges, six state parks, and three state aquatic preserves (see Figure 1.1.) all with their own agency authorities and jurisdiction.

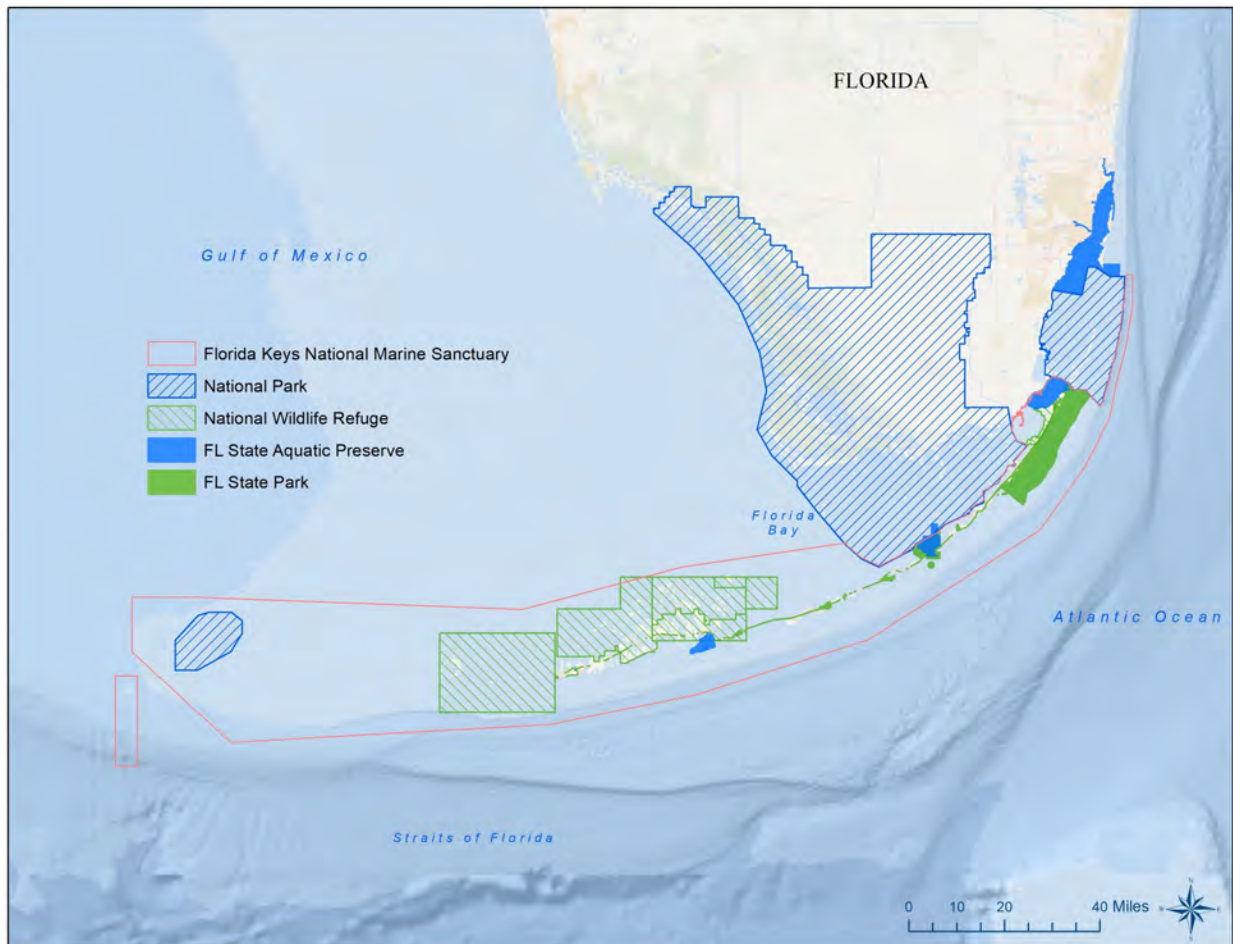


Figure 1.1. Florida Keys management jurisdictions: The FKNMS boundary is contiguous with three national parks, and within the sanctuary boundary are four national wildlife refuges, six state parks, and three state aquatic preserves. Image: NOAA

Since establishing FKNMS, NOAA has taken several actions to protect and manage the marine resources within the Florida Keys. NOAA's current management of the sanctuary is based on its 1997 final environmental impact statement (EIS) and a 2007 revised management plan. The 1997 EIS and management plan implemented sanctuary-wide regulations and established the nation's first comprehensive network of marine zones in FKNMS after years of planning, design, and public input. The FKNMS marine zones have differing levels of use and protection for each area and are designed to protect and preserve sensitive parts of the ecosystem while allowing activities that are compatible with resource protection. Since implementation of regulations and marine zones in 1997, NOAA updated FKNMS marine zone regulations to include the Tortugas Ecological Reserve in 2001, added a No Discharge Zone regulation within federal waters in 2010 (Florida state waters were designated as No Discharge in 2002), and updated non-regulatory management plan activities in a 2007 revised management plan. The NMSA requires NOAA's Office of National Marine Sanctuaries (ONMS) to periodically review and update all sanctuary management plans.

In addition to this FKNMS management action, other NOAA offices have taken actions designed to protect marine resources in the Florida/Caribbean region. NOAA's National Marine Fisheries Service (NMFS), for example, listed two coral species in 2005 and an additional five species in 2012 under the Endangered Species Act (ESA); designated critical habitat under the ESA for several coral and sea turtle species; designated Essential Fish Habitat (EFH) for several fish species; and implemented multiple other fishery management actions recommended by the Gulf of Mexico Fishery Management Council (GMFMC), South Atlantic Fishery Management Council (SAFMC), and the Atlantic Highly Migratory Species (HMS) Management Division of NMFS. Furthermore, NMFS implemented a GMFMC recommendation to establish the Pulley Ridge Habitat Area of Particular Concern (HAPC) in 2005, and is currently reviewing a GMFMC proposal to establish a new HAPC within the current Pulley Ridge HAPC where fishing with all bottom tending gear except bottom longline would be prohibited. This HAPC is designed to protect significant mesophotic reefs from impacts of bottom tending fishing gear.

The USFWS management of the Refuge Complex is guided by two comprehensive conservation plans (CCP), one covering the three refuges in the lower Keys and the other for Crocodile Lake National Wildlife Refuge. The 2006 and 2009 CCPs outline management strategies and corresponding resource needs over a 15-year period to protect, enhance, and restore the natural diversity and integrity of the ecological landscapes of the Florida Keys Refuges, and provide unique opportunities for research and wildlife-dependent recreational uses in cooperation with partners when those uses are found compatible and in accordance with USFWS policy and the National Wildlife Refuge System Administration Act of 1966, as amended at 16 U.S.C. §§ 668dd et seq. (Refuge Improvement Act). An overriding consideration reflected in both CCPs is that fish and wildlife conservation has first priority in refuge management. All public use of refuges must be compatible with the purposes for which each refuge was established.

The 1992 Management Agreement for Submerged Lands within the Boundaries of the Key West and Great White Heron National Wildlife Refuges (also known as the "backcountry management plan") is a cooperative agreement between the State of Florida Board of Trustees of the Internal Improvement Trust Fund and the USFWS. This agreement authorizes the USFWS to manage state submerged lands within the boundaries of the Key West National Wildlife Refuge and Great White Heron National Wildlife Refuge for public purposes set forth in the plan. The state of Florida Board of Trustees of the Internal Improvement Trust Fund may authorize management of these lands by virtue of Chapter 253.03 of

Florida Statutes and the USFWS may enter into such an agreement by virtue of the Refuge Improvement Act.

This same act enables the USFWS to cooperate with NOAA and the state of Florida on planning and implementation of resource management and enforcement actions where jurisdictions overlap in FKNMS.

1.2 Statutory authorities

1.2.1 National Marine Sanctuaries Act

The NMSA of 1972, as amended (16 U.S.C. §§ 1431 *et seq.*) authorizes the Secretary of Commerce to designate areas of the marine environment with special national significance due to their conservation, recreational, ecological, historical, scientific, cultural, archeological, educational, or aesthetic qualities as national marine sanctuaries. Among the purposes and policies of the NMSA are mandates 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 (16 U.S.C. § 1431(b)(1));
- 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 (16 U.S.C. § 1431 (b)(2));
- 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 (16 U.S.C. § 1431 (b)(3)); and
- 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 (16 U.S.C. §1431 (b)(7)).

1.2.2 Florida Keys National Marine Sanctuary and Protection Act

The 1990 FKNMSPA (Pub. L. 101-605) established the sanctuary, outlines the policy and purpose of the sanctuary, and provides direction for sanctuary management. FKNMS was established to protect and preserve living and other resources of the Florida Keys marine environment, educate and interpret information about sanctuary resources for the public, and manage human uses of the sanctuary consistent with the FKNMSPA. The FKNMSPA mandated the development of a comprehensive management plan and implementing regulations. Components of the management plan development relevant to this action include:

- Facilitate all public and private uses of the sanctuary consistent with the primary objective of sanctuary resource protection;
- Consider temporal and geographical zoning to ensure protection of sanctuary resources;
- Incorporate regulations necessary to enforce the elements of the comprehensive water quality protection program;
- Identify needs for research and establish a long-term ecological monitoring program;
- Identify alternative sources of funding needed to fully implement the management plan's provisions;

- Ensure coordination and cooperation between sanctuary managers and other federal, state, and local authorities with jurisdiction within or adjacent to the sanctuary; and
- Promote education among users of the sanctuary about coral reef conservation and navigational safety.

FKNMS regulations are codified at 15 C.F.R. part 922, subpart P. The proposed action to expand the sanctuary boundary, modify and create new marine zones, and update and/or establish regulations for the management of the expanded sanctuary and individual marine zones is consistent with, and would further the purposes and policies of, both the NMSA and the FKNMSPA.

1.3 The Office of National Marine Sanctuaries

ONMS is within NOAA’s National Ocean Service (NOS) and serves as the trustee for a system of marine protected areas, encompassing more than 600,000 square miles of ocean and Great Lakes waters from the state of Washington to the Florida Keys and from Lake Huron to American Samoa (Figure 1.2). ONMS manages the national marine sanctuaries pursuant to the NMSA (see Section 1.2.1 and www.sanctuaries.gov/about/legislation/). NOAA’s National Marine Sanctuary System regulations implement the NMSA and are codified at 15 C.F.R. part 922. ONMS cooperatively manages two marine national monuments with the USFWS and other federal and state authorities as codified at 50 C.F.R. Part 404.

NATIONAL MARINE SANCTUARY SYSTEM



Figure 1.2. National Marine Sanctuary System map. Image: NOAA, adapted from National Geographic Maps

These national marine sanctuaries and marine national monuments include both nearshore and offshore marine areas. Their designation provides protection for sensitive marine ecosystems, such as coral reefs and kelp forests; deepwater habitats and geologic features such as canyons and seamounts; migration corridors and other habitats used by ecologically and economically important or protected marine species; and historically significant maritime archaeological sites including shipwrecks and other artifacts. In addition, these areas serve as valuable educational, recreational, scientific, and economic resources. Sites of the National Marine Sanctuary System range in size from less than one square mile in Monitor National Marine Sanctuary offshore North Carolina to 582,578 square miles of ocean in Papahānaumokuākea Marine National Monument, located in the Northwestern Hawaiian Islands.

The National Marine Protected Areas (MPA) Center, established under Executive Order 13158 (May 2000), is a division of ONMS, with a mission to facilitate the effective use of science, technology, training, and information in the planning, management, and evaluation of the nation's system of MPAs. The MPA Center works in partnership with federal, state, tribal, and local governments and stakeholders to build a science-based, comprehensive national system of MPAs, and to support and enhance existing MPA programs across all levels of government.

ONMS fosters public awareness of marine resources and maritime heritage through scientific research, monitoring, exploration, education, and outreach, and works closely with its many partners and the public to protect and manage sanctuaries. ONMS is a leader in marine management through the protection of living marine resources, environmental quality, and maritime heritage, while maintaining recreational and commercial activities sustainable and compatible with long-term preservation.

1.4 Florida Keys National Marine Sanctuary

On November 16, 1990, Congress designated FKNMS, which encompasses 3,800 square miles. The sanctuary spans a shallow water interface between the Gulf of Mexico and the Atlantic Ocean, and is adjacent to most of the relatively shallow estuarine waters of South Florida, including those of Florida Bay and Biscayne Bay. FKNMS surrounds more than 1,700 islands, which constitute most of the limestone island archipelago of the Florida Keys. This archipelago extends from the Florida peninsula south and west over 220 miles (354 km), terminating at the islands of Dry Tortugas National Park. The oceanic boundary of FKNMS is the 300-foot isobath (~100-meter depth). FKNMS shares trusteeship of marine resources with the state of Florida, as 60 percent of the sanctuary falls under state jurisdiction. FKNMS protects open-ocean, off-shore reef tract and near-shore patch reefs, seagrass meadows, hard bottom regions, and fringing mangroves. FKNMS waters and habitats support high species diversity due to the presence of both tropical and subtropical species, including the largest documented contiguous seagrass community in the northern hemisphere and extensive coral reef habitat. The sanctuary is also home to maritime heritage resources that encompass a broad historical period.

The FKNMS management plan guides actions needed to protect the rich marine ecosystems of ocean and coastal waters of the Florida Keys while continuing to allow compatible, sustainable human uses. The existing regulations and management plan address key issues including ecosystem protection, water quality, maritime heritage, research and monitoring, and education and outreach. Some of these regulations and actions include efforts to:

- Establish a marine zoning scheme that includes five distinct zone types, including
 - **Wildlife management areas** that protect shallow water habitats and dependent wildlife,
 - **Sanctuary preservation areas** that separate conflicting uses,
 - **Special use areas** to support specific targeted activities such as research and restoration,
 - **Ecological reserves** to protect large contiguous habitats, and
 - **Existing management areas** to continue to manage areas that were established prior to 1997 by their own protections and restrictions in addition to regulations that are applicable sanctuary-wide;
- Prohibit discharge or deposit of matter into the sanctuary, including establishing all sanctuary waters as a No Discharge Zone (established through a 2010 regulation);
- Prohibit movement of, removal of, injury to, or possession of sanctuary historical resources;

- Establish regulations related to operating vessels in relation to sanctuary resources, markers, and human safety, among others;
- Prohibit removal of, injury to, or possession of coral or live rock;
- Develop a mooring buoy program to protect natural resources, mark marine zones, and facilitate multiple uses within sanctuary waters;
- Support education, outreach, and volunteer activities to facilitate better understanding of sanctuary resources and regulations and promote a stewardship ethic; and
- Facilitate enforcement of sanctuary regulations through a joint enforcement agreement with the state of Florida.

The sanctuary superintendent receives management advice and recommendations from a FKNMS sanctuary advisory council, a volunteer, community-based advisory group representative of community constituents that meets regularly throughout the Florida Keys. FKNMS maintains administrative offices in Key Largo and Key West and the Eco-Discovery Visitor Center in Key West. FKNMS also relies on an extensive network of volunteers and partners to assist in resource protection and outreach to the public.

1.4.1 Collaborative research and monitoring program highlights

Knowledge of marine resources including their extent and status is an essential component of effective management. Research and monitoring activities have been underway in the Florida Keys since the mid-1960s. However, since the designation of FKNMS, research and monitoring activities conducted by federal, state, and local agencies and academic and non-governmental organization partners have become much more coordinated and comprehensive. A few highlights follow.

As part of the WQPP, long-term monitoring programs for water quality, seagrass, and coral reefs have been in place since 1995. These programs have informed recommendations made and special studies implemented by the WQPP and serve as a means to assess the impacts of actions taken by the sanctuary and others on water quality, seagrass, and coral reef resources. Other long-term coral reef ecosystem monitoring programs include the Sanctuary Coral Reef Ecosystem Assessment and Monitoring Program (SCREAM) and the Florida Reef Resilience Program (FRRP). SCREAM operated formally in the Florida Keys from 1999 to 2012, monitoring coral and hard-bottom benthic communities and collecting data on percent cover, abundance, species diversity, and incidence of bleaching, disease, and other potential impacts such as marine debris. This monitoring effort is now part of the National Coral Reef Monitoring Program. FRRP, established in 2006, conducts monitoring to assess the incidence of coral bleaching and disease, data from which are used to identify reefs that are able to resist or recover from bleaching and other disturbances.

Research and monitoring efforts extend beyond the benthic communities. Understanding the population dynamics of reef fish, including how natural and human-made stressors are changing reef fish populations and communities, is important for assessing the condition of the coral reef ecosystem. Reef fish surveys have been conducted in the Florida Keys since the late 1970s. This effort has since been formally coordinated as the Reef Fish Visual Census monitoring program and includes well over 800 monitoring sites in the Florida Keys. Data collected from this program show population trends over time, habitat use by fish, and a comparison of fish populations inside and outside of the marine zones of the sanctuary (see below for specific study details).

Additional species-specific research on spiny lobster, queen conch, several sponge species, stone crab, and a host of reef fish species is conducted by the Florida Fish and Wildlife Conservation Commission's (FWC) Fish and Wildlife Research Institute (FWRI) scientists. Although each research effort has its own targeted objectives, this research as a whole provides essential information on life history, including recruitment, growth rates, movement patterns, ontogenetic changes in habitat use, reproductive biology, and spawning aggregations. Additionally, FWC researchers along with others have conducted research that compares fish and invertebrate abundance and size-structure inside and outside individual sanctuary marine zones.

Long-term research has been conducted to understand the physical and chemical dynamics of the Florida Keys including currents, meteorological events, ocean warming, and acidification. The Seakeys program, which operated from 1989 to 2012, collected data on water quality, physical oceanography, and benthic communities using fixed buoys and observation stations along the length of the reef tract. Fixed observation sites continue to collect essential data to help understand the changes due to ocean warming and ocean acidification.

Finally, in the area of Pulley Ridge, which is not currently part of the sanctuary, mapping and research activities were initially conducted in 1950 and served as the foundation for heightened interest in understanding and protecting the unique geology and benthic habitats present at this site as a HAPC (see Section 4.4 Pulley Ridge Unit for more details). The significance of this site and its potential connectivity with the Florida Keys inspired a recent multi-partner long-term study to assess the benthic habitats, fish species, and potential genetic connectivity with sites in the Dry Tortugas and wider Florida Keys region. (For more information see NOAA's Coral Ecosystem Connectivity from Pulley Ridge to the Florida Keys, 2011-2018.)

Although this section only provides a cursory summary of some of the ongoing and long-term research and monitoring activities, it shows the value and breadth of interest in understanding and preserving the marine, coastal, and terrestrial resources of the Florida Keys. The complete body of knowledge has been used to inform management decisions, is the backbone of the 2011 FKNMS condition report, and was used throughout this management plan review process to inform advisory council recommendations and agency preferred and alternative actions.

1.4.2 Marine zone implementation highlights

In 1997, the sanctuary implemented a comprehensive system of marine zones consisting of five main types: sanctuary preservation areas (SPAs), ecological reserves (ERs), wildlife management areas (WMAs), special use research only areas (SUAs), and existing management areas (EMAs).

Mooring buoy placement

Mooring buoys are an important management tool in FKNMS, providing boaters the ability to moor their vessels safely and avoid damaging coral reefs and other important ecosystems. Mooring buoys were first installed in 1981. FKNMS now maintains about 500 mooring buoys as part of an overall network of almost 800 buoys, which also includes 121 boundary buoys that mark marine zones, 160 WMA boundary buoys, shoreline marker buoys, and information buoys. Installation, inspection, and maintenance of this network of buoys requires six full-time staff, two 39-foot vessels, and specialized underwater hydraulic equipment.

Ecological reserves

The Western Sambo and Tortugas ERs have been studied by scientists to determine how protection has affected marine life in the reserve and in nearby areas. Protection of shallow reefs, deep reefs, mangrove forests, seagrass beds, sandy bottom, hard bottom, and other habitats supports the diversity of marine life associated with the Florida Keys coral reef ecosystem and represents an ecosystem-based approach to resource management. Each reserve is relatively large and includes an array of habitat types that support a diverse assemblage of marine organisms and protect species during different life cycle stages.

Western Sambo Ecological Reserve study results

Western Sambo ER is a nine square nautical mile reserve in the Lower Keys that begins near shore and reaches out to the 60-foot bathymetric contour line and includes nearshore shallow water habitats, inshore patch reefs, mid-channel reefs, offshore patch reefs, and the shallow bank reef. In one of many studies assessing reserve performance, scientists studied lobster populations within and in nearby areas to the reserve before and after reserve protection in 1997. Five years after reserve establishment, study results showed that the proportion of large adult spiny lobsters inside the reserve became greater. After 10 years of reserve protection, legal-sized lobsters were significantly more abundant within the reserve when compared with the corresponding fished site and the smaller Eastern Sambo SUA, which is a no take area. In time, larger sized adult lobsters were detected in nearby fished areas (where large lobsters were not common before).

Tortugas Ecological Reserve marine zone study results

The Tortugas ER, established in 2001 and divided into Tortugas North and Tortugas South, protects sandy bottom, seagrass beds, hard bottom, and coral reef habitats. The Tortugas ER contains reef fish spawning grounds and the deepest coral reefs in the sanctuary, and is considered a source of larvae for multiple species that live within Florida Keys marine habitats. Larvae are carried to the Florida Keys by the Florida Current.

Studies show that after 10 years of reserve protection, black grouper exhibited marked increases in population numbers and size when compared to black groupers in two nearby areas—Dry Tortugas National Park and Tortugas Bank—where fishing is allowed. Prior to reserve implementation in 2001, very few black groupers in the area grew larger than the minimum legal size for harvesting. By 2008, the reserve had the greatest number of larger grouper when compared to the two other areas. However, increases were also seen in the black grouper inside Dry Tortugas National Park and on Tortugas Bank, an observation attributed to spill-over from the reserve of larger black grouper.

Tortugas Ecological Reserve protects a multi-fish spawning site

Reserve protection helped restore the important reef fish spawning grounds at Riley’s Hump in the Tortugas South ER. After nine years of reserve protection, scientists witnessed the gathering of thousands of spawning mutton snapper at Riley’s Hump for the first time in years. This gathering of spawning fish known as a “fish spawning aggregation” at Riley’s Hump (inside Tortugas South) had all but disappeared prior to reserve establishment. Typically, such aggregations form at the same place at approximately the same times each year. Acoustic tracking of mutton snapper during spawning season showed that mutton snapper were moving from shallower reefs in the Dry Tortugas National Park’s Research Natural Area (a fully protected reserve) to Tortugas South where Riley’s Hump is located. During this journey, mutton snapper travel outside of reserve protection.

Surveys of fish spawning aggregations in the Florida Keys conducted by FWC FWRI scientists show that aggregations form in deeper waters on the outlier reef near the Florida (Gulfstream) current. Most fish spawning aggregation sites or suspected sites in the FKNMS are not afforded reserve or other kind of zone protection.

1.5 The National Wildlife Refuge System

The National Wildlife Refuge System, managed by USFWS, is the world's premier system of public lands and waters set aside to conserve America's fish, wildlife, and plants. The refuge system manages more than 850 million acres of land and water, 565 national wildlife refuges, 38 wetland management districts, and management responsibility for five marine national monuments. Most of the terrestrial acreage lies in Alaska, with only about 20 percent situated within the other 49 states. There are also expansive waters encompassing the Northwest Hawaiian Archipelago and within several island territories designated as national monuments in the Western Pacific Ocean administered by the USFWS under the National Wildlife Refuge System. USFWS manages 28 national wildlife refuges in Florida that comprise approximately 964,992 land and water acres. The mission of the refuge system, as defined by the National Wildlife Refuge System Improvement Act of 1997, is “to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” The Improvement Act establishes wildlife conservation as the primary mission of the refuge system.

National wildlife refuges provide important habitat for native plants and many species of mammals, birds, fish, amphibians, reptiles, insects, and other invertebrates. They also play a vital role in the recovery of threatened and endangered species.

1.5.1 National Wildlife Refuge System Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997

The statutory authority for USFWS to update the Backcountry Management Plan is derived from the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge Improvement Act of 1997 (Refuge Improvement Act), 16 U.S.C. §§ 668dd - 668ee. Section 4(a)(3) of the Refuge Improvement Act states: “With respect to the System, it is the policy of the United States that each refuge shall be managed to fulfill the mission of the System, as well as the specific purposes for which that refuge was established.” Section 4(a)(4) states: “In administering the System, the Secretary shall monitor the status and trends of fish, wildlife, and plants in each refuge.” The Refuge Improvement Act provides USFWS the authority to establish policies, regulations, and guidelines governing habitat management planning within the system of national wildlife refuges (Service Manual 620 FW 1). Administration of national wildlife refuges is guided by the mission and goals of the refuge system, congressional legislation, executive orders, and international treaties. Policies for management options for refuges are further refined by policy and guidelines established by the Secretary of the Interior and by the director of USFWS.

The Florida Keys Refuges Complex consists of Key West National Wildlife Refuge, Great White Heron National Wildlife Refuge, National Key Deer Refuge, and Crocodile Lake National Wildlife Refuge,

established in 1908, 1938, 1957, and 1980, respectively, under various authorities. The enabling legislation, which established and authorized the individual refuges articulate various purposes. For more details see Section 1.6.

1.6 Florida Keys National Wildlife Refuge Complex

The USFWS's Florida Keys National Wildlife Refuge Complex manages four National Wildlife Refuges, including Crocodile Lake National Wildlife Refuge, National Key Deer Refuge, Great White Heron National Wildlife Refuge, and Key West National Wildlife Refuge. Each refuge has specific enabling legislation and purpose as designated by executive orders and subsequent federal statutes passed during the establishment of each refuge.

Management of the refuge complex is guided by two comprehensive conservation plans (CCP) and several management plans derived from these CCPs that include objectives such as habitat, fire management, and visitor services. These documents guide staff in addressing National Wildlife Refuge System trust resource stewardship including actions such as to maintain and, where appropriate, restore the biological integrity, diversity, and environmental health of these resources. The Lower Keys Refuges also have a backcountry management plan, which is a vehicle for a cooperative agreement between USFWS and the state of Florida for the management of state-owned sovereign submerged lands within the boundaries of Key West National Wildlife Refuge and Great White Heron National Wildlife Refuge.

The Florida Keys National Wildlife Refuge Complex is located entirely within Monroe County, Florida, with administrative offices located in Big Pine Key. The northernmost refuge in the complex is Crocodile Lake National Wildlife Refuge and is adjacent to a series of protected environmental areas, which include Everglades National Park to the northwest, Dagny Johnson Key Largo Hammock Botanical State Park to the east, and Biscayne Bay Aquatic Preserve and Biscayne National Park to the north.

Crocodile Lake National Wildlife Refuge is an important, biologically unique area currently closed to general public use. The refuge is home to one of the few examples of the natural habitats that once existed throughout the Florida Keys National Wildlife Refuge such as hardwood hammocks, mangrove wetlands, and open estuarine waters managed for the benefit of protecting species listed as threatened and endangered under the federal ESA. Focal ESA-listed species are the American crocodile, Key Largo woodrat, Key Largo cotton mouse, Stock Island tree snail, and Schaus' swallowtail butterfly. Hundreds of other wildlife and plant species benefit from refuge habitat conservation and restoration.

National Key Deer Refuge, Great White Heron National Wildlife Refuge, and Key West National Wildlife Refuge are all located in the Lower Keys. National Key Deer Refuge encompasses the area between Big Pine Key/No Name Key and Sugarloaf Key, including numerous remote backcountry islands. Great White Heron National Wildlife Refuge spans a protracted series of islands north of U.S. Highway 1 from north of Big Pine Key in the east to north of Key West in the west. A substantial portion of Great White Heron National Wildlife Refuge overlaps with National Key Deer Refuge. Key West National Wildlife Refuge consists of the Marquesas Keys and 13 other keys distributed over approximately 375 square miles of open water west of Key West.

The Lower Florida Keys National Wildlife Refuges are a collection of low-lying, subtropical islands between the Gulf of Mexico and the Atlantic Ocean that protect all the habitats representative of the Florida Keys ecosystem, including the globally imperiled pine rockland and tropical hardwood hammock.

These geologically and climatically distinct islands provide a haven for a diversity of native flora and fauna, including endemic, threatened, endangered, and candidate species such as the Key deer, Miami blue butterfly, and many more. Collectively the Lower Keys National Wildlife Refuges protect, enhance, and restore the natural diversity and integrity of the native landscapes of the Lower Florida Keys, and provide unique opportunities for research and compatible wildlife-dependent recreational uses.

Contained within the boundaries of the Lower Florida Keys National Wildlife Refuge is over 4,700 acres of designated wilderness comprising 28 keys and mangrove islands. These wilderness areas, established through the Wilderness Act, are managed such that the wilderness character of the area is preserved. The islands and surrounding waters of the Great White Heron and Key West national wildlife refuges are colloquially called “the backcountry.”

The Refuge Complex completed a backcountry management plan in 1992 that responded to an increase in recreational and commercial use of refuge islands and surrounding state-owned waters in the Florida Keys. An increase in wildlife-human interactions involving disruption of roosting, foraging, and nesting of bird species led to several key management actions. Some of these actions:

- Prohibit the use of personal watercraft, airboats, water skiing, and aircraft landing within specified areas of the Refuge Complex;
- Establish idle speed, no motor, and no access buffer zone in select areas for the protection of wildlife;
- Increase public education for backcountry boaters through press releases, public service announcements, brochures, informational maps, and educational panels at boat ramps;
- Enhance enforcement of current regulations that require a permit for commercial use of refuge islands;
- Increase enforcement with personnel to ensure compliance with the terms of this plan and existing rules covering camping, vegetation clearing, littering, and illegal structures; and
- Close mangrove islands where public use opportunities are virtually nonexistent and inherently incompatible with wildlife.

There is extensive overlap between FKNMS and the Refuges Complex. Therefore, with the establishment of FKNMS, the refuges were designated by NOAA as existing management areas under the sanctuary's marine zoning plan. Additionally, NOAA adopted the specific place-based restrictions identified in the USFWS (1992) Backcountry Management Plan and designated those zones as WMAs. USFWS co-manages 20 of the sanctuary's 27 WMAs. This joint management approach supplements existing refuge and state authorities with sanctuary regulations and facilitates the comprehensive protection of natural resources.

For the purposes of this DEIS, the portions of the Florida Keys National Wildlife Refuge Complex under consideration include the marine portions of Crocodile Lake National Wildlife Refuge, which includes a single associated sanctuary WMA, and the marine portions of Great White Heron and Key West national wildlife refuges in the Lower Keys, which include 20 sanctuary WMAs. The Lower Keys National Wildlife Refuges, specifically those portions of state-owned sovereign submerged lands lying below mean high water within Great White Heron and Key West national wildlife refuges, are managed through a cooperative agreement between the USFWS and the state of Florida and associated backcountry management plan.

1.7 Project location: Southern Florida, Florida Keys, and Pulley Ridge

The Florida Keys are part of the much larger South Florida regional ecosystem, which possesses a wealth of natural resources while also facing major ecological challenges and restoration opportunities. The South Florida ecosystem supports unique and diverse habitats, including seagrass beds of Florida Bay, mangrove swamps, the Everglades sawgrass prairies, the Florida Keys tropical hardwood hammocks, mangroves, and coral reefs. The South Florida ecosystem has also been extensively altered through development of drainage canals completed to facilitate coastal development, agriculture, and flood control. These canals have significantly altered the distribution, timing, and quality of freshwater flow within the South Florida watershed, resulting in degraded marine habitats and other environmental changes that continue to impact the estuaries of Florida Bay and the environment of the Florida Keys.

The sanctuary contains components of five distinct physiographic regions: Florida Bay, the Southwest Continental Shelf, the Florida Reef Tract, the Florida Keys, and the Straits of Florida. The regions are environmentally and geologically unique, and together form the framework for the sanctuary's diverse terrestrial and aquatic habitats. Pulley Ridge is included as a sixth physiographic region as it is included in the proposed action and alternatives (See Figure 1.3 and Chapter 4 for more details).

The Florida Keys ecosystem is part of two large marine ecosystems, the Gulf of Mexico and the Southeast Continental Shelf, and is also ecologically connected to the Caribbean Sea. These large marine ecosystems are linked by the Loop Current, an area of warm water that travels up from the Caribbean, past the Yucatan Peninsula, and into the Gulf of Mexico. The current is also known as the Florida Current as it flows through the Florida Strait, into the Gulf Stream, and heads north up the eastern coast of the United States. The Loop Current, its eddies, and boundary currents affect biological communities in the Gulf as pathways for the distribution of fish larvae and juveniles, as well as pollutants. Because of these connections, international coordination is an important component of management of the Florida Keys ecosystem.

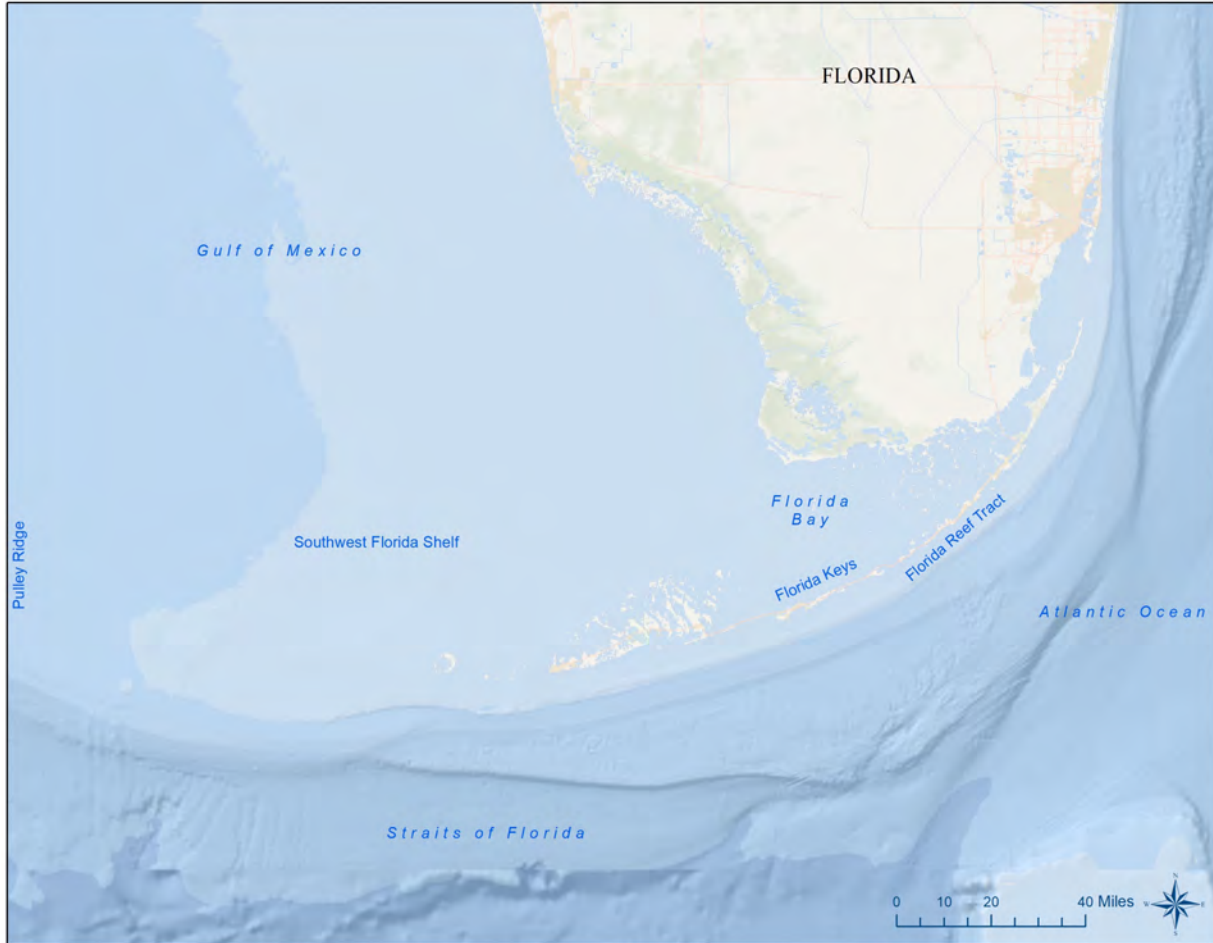


Figure 1.3. Project location: South Florida regional ecosystem includes interconnected natural resources and physical features. Image: NOAA

1.8 Public involvement

According to Council on Environmental Quality (CEQ) regulations (40 C.F.R. § 1506.6(a)), federal agencies are required to “make diligent efforts to involve the public in preparing and implementing their NEPA [National Environmental Policy Act] procedures.” The following section outlines public involvement in the sanctuary marine zoning and regulatory review process.

1.8.1 Scoping

One aspect of public involvement is the scoping process (40 C.F.R. § 1506.6(b)). The scoping process begins with a notice of intent to prepare an environmental impact statement, which announces public scoping meetings and invites the public to comment on the proposed actions for 30 days.

On April 19, 2012, NOAA and the U.S. Department of Interior’s (DOI) USFWS published a notice of intent in the Federal Register, which notified the public of the proposed action, announced five scoping meetings, and solicited public comment. ONMS and USFWS held public scoping meetings in Marathon on June 19, 2012; Key Largo on June 20, 2012; Key West on June 21, 2012; Miami on June 26, 2012; and Fort Myers on June 27, 2012. Several hundred people participated in these meetings and provided

input on specific issues to be analyzed or addressed as part of the marine zoning and regulatory review (Figure 1.4).



Figure 1.4. Public input was provided at scoping meetings throughout the Florida Keys, Miami, and Fort Meyers in 2012. Photo: NOAA

In addition to public scoping meetings, ONMS and USFWS accepted written comments from April 19, 2012, to June 29, 2012. Comments were provided in emails, letters, faxes, and electronic submission on <http://www.regulations.gov>. A specific section on the FKNMS website (<http://floridakeys.noaa.gov/review/welcome.html>) serves as a central location of project information while the review is underway and the DEIS is being developed. During the comment period, the agencies received over 500 comments. The website provides a summary document of all scoping comments (<http://floridakeys.noaa.gov/review/documents/scopingcommentssummary.pdf>) and a link (<http://www.regulations.gov/#!docketDetail;rpp=25;po=0;D=NOAA-NOS-2012-0061>) to access all of the scoping comments received on the project.

As part of formal scoping, the Sanctuary Advisory Council played a significant leadership role throughout this review and the alternatives development process. The advisory council and three community working groups met over a period of 22 months—January 2012 through October 2014—to review scientific and human use data and information, hear further public comment, and develop advice and recommendation for the sanctuary superintendent as well as the Refuges Complex manager to consider when developing alternatives related to marine zones within the sanctuary. A fourth community working group met for a two-day workshop in July 2015 to address artificial habitats, an advisory council priority issue not previously discussed by the initial three community working groups. Over 70 meetings were held throughout the Florida Keys for the advisory council and community working groups throughout this process. The website provides more information and summary documents of the advisory council and working groups: floridakeys.noaa.gov.

ONMS reviewed all of the scoping comments and sanctuary advisory council input and considered such comments when developing the content and scope of this DEIS.

In addition to gathering public input during formal scoping, NOAA worked closely with and sought input from numerous pertinent resource agencies and researchers on the development of the DEIS. In addition, informal briefings with the Gulf of Mexico Fishery Management Council (GMFMC) and the South Atlantic Fishery Management Council (SAFMC) have been ongoing since initiation of the public scoping for this DEIS.

1.8.2 Public review of the draft environmental impact statement

The next step of public involvement is to ensure a wide circulation of the DEIS and to solicit public comments on this document. NOAA will be accepting public comment on the DEIS until January 31, 2020. Availability of the DEIS is announced in the Federal Register, on various email lists, on the sanctuary website, and in local newspapers. For a full list of public meetings see floridakeys.noaa.gov.

During the public comment period, oral and written comments are anticipated from federal, state, and local agencies and officials, from organizations, and from interested individuals. After the public comment period is over, the comments will be reviewed. A summary of these comments and the corresponding responses from the appropriate agency will be included in the final EIS. If necessary, changes will be made to the EIS as well as the proposed rule and draft management plans as a result of the public comments.

If NOAA moves forward with a final action, a final EIS, record of decision, and notice of proposed rulemaking, which includes the official draft regulations, would be published in the Federal Register. The notice of proposed rulemaking will also have a public comment period. Following that, NOAA will issue a final rule that promulgates changes to the regulations and terms of designation of the sanctuary, as well as a final set of regulations.

As part of the rulemaking process, formal consultation with the GMFMC and SAFMC pursuant to Section 304(a)(5) of the NMSA will take place to update regulations for fishing and extend existing and updated fishing regulations to the expanded areas of the sanctuary. Consultation with other natural resource management agencies (e.g., NMFS, USFWS, and EPA) will also continue after the publication of the DEIS.

1.9 Organization of environmental impact statement

Chapter 1 (Introduction and background) is a background discussion of the statutory authorities, ONMS, and National Wildlife Refuge System; a summary of existing FKNMS and refuge management; and an overview of the public involvement process for the proposed action.

Chapter 2 (Purpose of and need for action) provides the purpose of and need for the proposed action, a summary of the scope of the DEIS, and an overview of the other regulatory requirements and consultations that NOAA will be conducting as part of this environmental review.

Chapter 3 (Description of alternatives) describes the alternatives development process, the no action alternative, the three alternatives considered in detail, and alternatives considered but eliminated from detailed evaluation. For the four alternatives considered in detail, Chapter 3 describes the components of

each alternative including the sanctuary boundary, sanctuary-wide regulations, marine zone boundaries, marine zone regulations, and management plan activity proposals.

Chapter 4 (Affected environment) describes the existing conditions in FKNMS to provide a baseline for assessing environmental impacts that may occur under each alternative. Baseline information includes a description of the physical and biological environment, historical resources, and human uses, including socioeconomic resources.

Chapter 5 (Environmental consequences) includes an evaluation of potential impacts on the physical and biological environment, historical resources, and human uses, including an in-depth consideration of socioeconomic impacts that may occur as a result of implementing each alternative. NOAA evaluated the direct, indirect, short-term, long-term, and cumulative impacts and then compared the relative impacts among the four alternatives.

Chapter 6 (Conclusions) states the preferred alternative, describes any resource commitments and unavoidable adverse environmental impacts, evaluates the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity, and assesses whether the proposed action would result in the irreversible and irretrievable commitment of resources.

Chapter 7 (References) provides references for the DEIS.

The appendices include an index, report preparers, technical regulatory updates, an updated draft programmatic agreement for historical resources, and EFH, ESA, and critical habitat resources and species lists. Additional background on the institutional setting and other agency partners is also included.

CHAPTER 2

PURPOSE AND NEED FOR ACTION

2.1 Proposed action

NOAA proposes to: (1) expand the boundary of FKNMS, (2) update sanctuary-wide regulations, (3) modify existing and create new marine zones, (4) update associated marine zone-specific regulations, and (5) revise the sanctuary management plan. NOAA has considered state and federal authorities in proposing new regulations to ensure protection and management of sanctuary resources. Proposed new regulations are intended to complement existing authorities.

The foundation of the proposed action and alternatives outlined in Chapter 3 are the suite of Sanctuary Advisory Council recommendations, which are based on the goals, principles, and objectives outlined in the 2012 FKNMS advisory council regulatory and zoning alternatives development work-plan (see www.floridakeys.noaa.gov/restoration).

2.2 Purpose of action

The purpose of the proposed action is threefold:

- (1) To meet the purposes and policies of the NMSA (16 U.S.C. § 1431(b)), in particular:
 - 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;
 - to provide comprehensive and coordinated conservation and management of these marine areas, and activities affecting them, in a manner which complements existing regulatory authorities;
 - 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;
 - to facilitate to the extent compatible with the primary objective of resource protection, all public and private use of the resources of the marine areas not prohibited pursuant to other authorities; and
 - 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.

This action will also meet mandates outlined in the FKNMSPA, which directs the sanctuary to protect and preserve living and other resources of the Florida Keys marine environment, educate and interpret information about sanctuary resources for the public, and manage human uses of the sanctuary consistent with the FKNMSPA.

- (2) To implement specific actions identified in the 2007 FKNMS management plan, specifically *Strategy R.2: Regulatory review and development*. Additional guidance and recommendations specific to sanctuary marine zones were provided by the Sanctuary Advisory Council after they hosted a marine zoning

workshop in 2008 to review the location, arrangement, size, effectiveness, and potential unintended consequences of the sanctuary marine zones; and

(3) To act upon several recommendations of the FKNMS Sanctuary Advisory Council. These recommendations are based primarily on the 2011 FKNMS condition report, which provided a synthesis of research and monitoring data collected over time on status and trends of sanctuary resources. Based on these findings, the Sanctuary Advisory Council developed goals, objectives, and a draft work plan to inform and guide the 2012 management plan review process and address existing and emerging threats to sanctuary resources. Specifically, this proposed action seeks to address the following Sanctuary Advisory Council recommendations:

- (1) expand the sanctuary boundary to provide additional protections for nationally significant benthic habitats and mesophotic reef systems with biological, ecological, and/or structural links to the existing sanctuary.
- (2) provide additional site-specific protections for important benthic habitats and associated wildlife while, as appropriate, allowing compatible human uses and providing opportunities for research and recovery of resources from observed impacts.

This DEIS describes the various adjacent and connected ecosystems proposed for incorporation into FKNMS, the resources considered for strengthened or additional protection through site specific marine zones, the alternative scenarios for achieving this goal, and the NOAA preferred alternative.

2.3 Need for action

The need for the proposed action is based on widespread, acute, chronic, and emerging threats to marine resources and federal trust resources in the Florida Keys. The existing marine zones and management plan activities designed and implemented by FKNMS in the mid-1990s are no longer sufficient to ensure long-term resource protection and ecosystem function into the future considering those threats. This assessment is based primarily on the 2011 FKNMS condition report, which concluded that resources in the Florida Keys appear to be in fair to fair/poor condition, are generally either stable or in decline, and that emerging threats to sanctuary resources include invasive species, climate change, increasing coastal and visitor populations, and recreational use of the sanctuary (see <https://sanctuaries.noaa.gov/science/condition/fknms/welcome.html> for the condition report summary and full document).

Since release of the 2011 condition report, sanctuary resources have been impacted by Hurricane Irma, a coral disease outbreak, and a seagrass die-off, among other threats (see Chapter 4 for details).

The quality of the marine environment and marine resource health of the Florida Keys are inextricable. The Florida Keys support more than 77,000 residents and approximately 5.5 million visitors, who collectively contribute to the \$4.7 billion economy (Key West Chamber of Commerce 2018). Approximately 60 percent of the economy is tied directly to marine-related activities, including commercial and recreational fishing, boating, diving, wildlife viewing, and other various tourist-related activities. To maintain the status quo of the declining marine environment puts the economy and jobs at risk.

FKNMS is currently operating under a 2007 revised management plan and regulations largely developed as part of the original management plan process in 1997, with minor modifications to the regulations in 2001 and 2010. An updated management plan and associated regulations are needed because much has occurred since 1997: resources within the sanctuary face increased threat from local, regional, and global impacts; a wide range of scientific data and information has become available; and visitor numbers, use patterns, types, and recreational interests have also changed. Each of these changes has major implications for FKNMS.

Consequently, the sanctuary's 1997 regulations and marine zones and 2007 management plan need to be updated to reflect current strategies for management decisions regarding natural and cultural resource protection and providing recreational access and public use opportunities.

During scoping for this DEIS, the public supported the need for increased emphasis on a more ecosystem-based management approach to better protect the region's marine resources. To that end, there was support for sanctuary expansion and updated marine zones—actions that are consistent with the purposes and policies of the NMSA and the FKNMSPA. More specifically, the need for this proposed action is to extend national marine sanctuary protections to areas that have significant marine resources with demonstrated connectivity to existing sanctuary resources and to apply management strategies that target changing conditions, use patterns, and emerging threats to resources. The proposed action is informed by recent scientific findings showing degraded habitat in the sanctuary and how those resources can exhibit improvements with application of long-term management and conservation strategies, which include marine zoning.

At the same time, there is a need for continued research, exploration, restoration, and education related to these significant ocean resources. This work would be critical for assessing changes occurring in the environment, fostering a stewardship ethic, and for developing a better understanding of the ecosystem services sanctuary resources provide for communities throughout the Florida Keys.

2.4 Scope of environmental impact statement

The National Environmental Policy Act (NEPA) requires that federal agencies document a detailed assessment of the environmental impacts of their proposed actions that could significantly affect the environment and include the public in the decision-making process. The proposed action and action alternatives have been specifically developed to facilitate improved management and protection of identified priority resources within FKNMS and the Refuge Complex. The proposed action and action alternatives were designed with consideration of significant public and stakeholder input over a long period of time. The proposed action is intended to protect resources and generally reduce impacts of human activities on the environment. This DEIS evaluates the potential adverse and beneficial environmental effects of the proposed regulatory actions consistent with NEPA and the White House Council on Environmental Quality (CEQ) regulations implementing NEPA.

Section 304(a)(4) of the NMSA requires that “terms of designation may be modified only by the same procedures by which the original designation is made.” When FKNMS was designated under the NMSA and FKNMSPA, an EIS was prepared. Under the NMSA, alterations to the terms of designation require the sanctuary go through the same procedures as site designation, including an EIS, regardless of the significance of the impacts of the proposed alteration (16 U.S.C. § 1434(a)(4)).

This DEIS does not include specific regulatory text. Any proposed regulations will be released separately following public comment on this DEIS. At that time, a detailed discussion of the regulatory text will be included in the notice of proposed rulemaking and published in the *Federal Register* for public comment.

2.5 Cooperating agency

NEPA lays the groundwork for coordination between the lead agency preparing an EIS and other federal agencies that may have special expertise on an environmental issue or that have jurisdiction by law. These other agencies, referred to as “cooperating agencies,” are responsible for assisting the lead agency through early participation in the NEPA process, including scoping. The cooperating agencies provide technical input to the environmental analysis and provide staff support, as needed, to the lead agency.

For this proposed action, USFWS has technical expertise regarding the ecological resources within its wildlife refuges as well as statutory and regulatory authority over wildlife refuges that exist within FKNMS. Therefore, USFWS agreed to be a cooperating agency for purposes of preparing this DEIS.

2.6 Related consultations

In addition to NEPA, NOAA is required to comply with several related environmental statutes applicable to the proposed action, including those described below. Compliance with these statutes and other legal requirements is discussed in greater detail in Appendix D.

2.6.1 Endangered Species Act

The Endangered Species Act (ESA) of 1973 as amended (16 U.S.C. §§ 1531 *et seq.*), provides for the conservation of species that are endangered or threatened throughout all or a significant portion of their range, and the conservation of the ecosystems on which they depend. Section 7(a)(2) of the ESA states that each federal agency shall, in consultation with the Secretary of Interior and/or Commerce, ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat.

In addition, ESA Section 10(a)(1)(A) authorizes NMFS and USFWS to issue permits for scientific purposes or to enhance the propagation or survival of listed species. The permitted activity must not operate to the disadvantage of the species and must be consistent with the purposes and policy set forth in section 2 of the Act. Section 10(a)(1)(A) permits are also required:

- when a reasonable and prudent alternative calls for scientific research that will result in take of the species (this includes scientific research carried out by the services);
- when the agency, applicant, or contractor plans to carry out additional research not required by an incidental take statement that would involve direct take (if this is part of the action and direct take is contemplated, a permit is not needed); and
- for species surveys associated with biological assessments (usually developed during informal consultation) that result in take, including harassment.

Section 4.2.3 of this EIS describes the species listed under the ESA that may occur within the action area, including all areas affected directly or indirectly by the proposed action and not merely the immediate area involved in the action. 50 C.F.R. § 402.02. Section 5.2.2 describes the potential impacts to each listed species. NOAA will initiate consultation with NMFS and USFWS at the time of public release of

this DEIS. NOAA has been coordinating with NMFS and USFWS and received technical assistance through the drafting of this DEIS. Appendix D provides additional information regarding NOAA’s ESA consultation including correspondence with USFWS and NMFS.

2.6.2 Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA, 16 U.S.C. §§ 1361 *et seq.*) protects and conserves marine mammal species by placing a moratorium on harassing, hunting, capturing, or killing any marine mammal or attempting any of these. If a project proponent determines that an action could incidentally harass (“take”) marine mammals, the proponent must consult with either the USFWS or NMFS to determine if a permit to take a marine mammal is required. A recent redefinition of “take” of an MMPA-protected species occurred under the FY 2004 Defense Authorization Act (House Bill 1588), where an animal is “taken” if it is harassed, and where harassment is defined as “(i) any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild or (ii) any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered” (Section 315(f) P.L. 107–314; 16 U.S.C. § 703 note).

Section 4.2.3 of this EIS describes the species covered under the MMPA that may occur within the action area. NOAA/ONMS determined that potential impacts to marine mammals did not rise to a level that required consultation under MMPA.

2.6.3 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. §§ 1801 *et seq.*) fosters long-term biological and economic sustainability of the nation’s marine fisheries in U.S. federal waters out to 200 nautical miles from shore. Key objectives of the MSA are to prevent overfishing, rebuild overfished stocks, increase long-term economic and social benefits, and ensure a safe and sustainable supply of seafood. The Essential Fish Habitat (EFH) provisions of the MSA require NMFS to provide recommendations to federal and state agencies for conserving and enhancing EFH for any actions that may adversely impact EFH. EFH is defined (50 C.F.R. § 600.10) as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” Federal agencies must consult with NMFS and assess the effects of their actions on EFH.

Section 4.2.3 of this EIS describes EFH designated under the MSA that may occur within FKNMS. Section 5.2.2 describes the potential impacts to designated EFH. NOAA will initiate consultation with NMFS at the time of public release of this DEIS. NOAA has been coordinating with NMFS and received technical assistance through the drafting of this DEIS. Appendix D provides additional background regarding the EFH consultation including correspondence with NMFS.

2.6.4 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA, 16 U.S.C. §§ 1451 *et seq.*) was enacted in 1972 to encourage coastal states, Great Lake states, and U.S. territories and commonwealths (collectively referred to as “coastal states” or “states”) to preserve, protect, develop, and where possible, to restore or enhance the resources of the nation’s coastal zone. Section 307 of the CZMA is known as the “federal

consistency” provision. The federal consistency provision requires federal actions (inside or outside a state’s coastal zone) that affect any land or water use or natural resource of a state’s coastal zone, to be consistent with the enforceable policies of the state coastal management program. The term “effect on any coastal use or resource” means any reasonably foreseeable effect on any coastal use or resource resulting from the activity, including direct and indirect (cumulative and secondary) effects. The federal consistency regulations can be found at 15 C.F.R. part 930.

In accordance with 15 C.F.R. part 930, subpart C, NOAA will submit a federal consistency determination to the Florida DEP at the time of public release of this DEIS. Appendix D provides more information on CZMA and the consultation requirements.

2.6.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act of 1966 (NHPA) (54 U.S.C. § 306108) requires federal agencies to take into account the effects of their undertakings on historic properties in accordance with regulations issued by the Advisory Council on Historic Preservation (ACHP) at 36 C.F.R. part 800. The regulations require that federal agencies consult with states, tribes, and other interested parties (consulting parties) when making their effect determinations.

NOAA will initiate Section 106 consultation with the Florida State Historic Preservation Office (SHPO) at the time of public release of this DEIS. NOAA has been coordinating with the SHPO and the Advisory Council on Historic Preservation to review and update FKNMS’s expired Section 106 programmatic agreement. During the public comment period for this DEIS, NOAA is also seeking public comment on the draft programmatic agreement, available in Appendix C.

2.6.6 Other consultations

Executive Order 13795 directs the Secretary of Commerce to refrain from designating or expanding any national marine sanctuary unless the proposal includes a full accounting from the Department of the Interior (DOI) of any energy or mineral resource potential (including offshore energy from wind, oil, natural gas, methane hydrates, and any other sources that the Secretary of Commerce deems appropriate) within the proposed area, and the potential impact of the expansion on energy or mineral resource potential within the designated area.

In August 2018, NOAA initiated consultation with DOI and received a response from DOI in October 2018. Information pursuant to this directive is included in section 4.6 and Appendix G of this DEIS.

CHAPTER 3

DESCRIPTION OF ALTERNATIVES

This chapter includes descriptions of the proposed range of alternatives (including the preferred alternative) and detailed descriptions of the individual components of each alternative (e.g., boundary, marine zones, etc.). To implement this action, NOAA is considering four alternatives. Each alternative includes the following components: (1) changing the sanctuary boundary, (2) updating sanctuary-wide regulations, (3) modifying existing marine zones and creating new ones, (4) updating marine zone-specific regulations, and (5) updating the sanctuary management plan (see Tables 3.1-3.7 for summaries of the alternatives and their components). An impact analysis of the alternatives is included in Chapter 5. NOAA considered federal and state authorities in proposing new regulations and how these regulations complement existing authorities.

NOAA developed a reasonable range of alternatives for review and evaluation as required by the White House Council on Environmental Quality's (CEQ) NEPA regulations at 40 C.F.R. §§ 1502.14 and 1505.1(e). This DEIS also complies with NOAA's Companion Manual to Administrative Order 216-6A, which states that an EIS will include an analysis that considers and weighs the environmental impacts of the proposed action, the environmental impacts of alternatives to the proposed action, and alternatives available for reducing or avoiding adverse environmental effects.

Introduction to alternatives

The proposed alternatives are based largely on Sanctuary Advisory Council recommendations, which follow the goals, principles, and objectives outlined in the 2012 Florida Keys National Marine Sanctuary Advisory Council Regulatory and Zoning Alternatives Development Workplan (available at <https://floridakeys.noaa.gov/blueprint>). In particular, NOAA developed the alternatives from the recommendations presented at the June, August, and October 2014 advisory council meetings which included the work completed by three community working groups. (For the full administrative record of advisory council discussion and action see this section of the FKNMS website: <http://floridakeys.noaa.gov/review/workgroups.html>). Sanctuary staff reviewed and, where appropriate, further revised alternatives based on additional input provided by academic researchers and staff from FKNMS and USFWS. NOAA also coordinated with USFWS, a cooperating agency for this DEIS.

As described in Chapter 2, the proposed alternatives are a result of the need for increased protection of the Florida Keys marine ecosystems, including protection of sanctuary and refuge resources dependent upon the marine environment. In developing the alternatives and identifying the preferred alternative for analysis in this DEIS, NOAA considered possible boundary, regulatory, marine zone, and management plan changes that would be consistent with achieving increased resource protection while also allowing for compatible use.

In addition to the purpose and need outlined in Chapter 2, NOAA used the following screening criteria to determine a range of reasonable alternatives:

- Alternatives must be feasible, enforceable, and aim to facilitate compliance with regulations;
- Alternatives must be consistent with the purposes and policies of the NMSA and FKNMSPA; and, where the alternatives overlap with the Refuge Complex, should be consistent with the

National Wildlife Refuge System Improvement Act, U.S. Department of Interior/USFWS regulations and policy, and the National Wildlife Refuge System;

- Alternatives should support and be aligned with the USFWS Lower Keys Refuges CCPs;
- Alternatives must be consistent with and achieve the overall purpose and need of the proposed actions as described in Chapter 2 of this DEIS;
- Alternatives must address resource management issues, generate beneficial environmental effects through implementation of management actions, and address uses or other activities that have an adverse effect on sanctuary resources;
- Alternatives should allow for the incorporation and consideration of recent or best available data and scientific knowledge;
- Alternatives should maximize environmental benefits, while avoiding unnecessary adverse socioeconomic impacts;
- Alternatives should remove obsolete requirements and improve the clarity of existing sanctuary regulations;
- Alternatives should, where appropriate, increase consistency of state and federal regulations, including with other relevant national marine sanctuary sites;
- Alternatives should be consistent with and aim to achieve the Sanctuary Advisory Council goals, objectives, and principles outlined in their 2012 Florida Keys National Marine Sanctuary Advisory Council Regulatory and Zoning Alternatives Development Workplan.

Alternatives initially considered that did not meet these screening criteria are listed in Section 3.7.

Summary of alternatives

This chapter describes four alternatives: Alternative 1 (no action); Alternative 2 (slightly more environmentally protective); Alternative 3 (preferred alternative, with many components identical to Alternative 2 or progressively more environmentally protective); and Alternative 4 (many components identical to Alternative 2 or 3 or progressively more environmentally protective).

Each alternative describes NOAA's proposals for changes to five specific components of FKNMS management: (1) the sanctuary boundary; (2) sanctuary-wide regulations; (3) marine zone boundaries within the sanctuary; (4) marine zone regulations; and (5) changes to the sanctuary management plan. The document is organized in this way to provide the reader information to compare the four overall alternatives as well as proposed changes to the specific management components within each alternative. NOAA will consider and compare the environmental consequences (discussed in Chapter 5) for each alternative. Table 3.1 provides a summary of the alternatives and their components presented in this chapter.

Alternative 1: No action (status quo)

The no action alternative would maintain the existing sanctuary boundary, sanctuary-wide regulations, marine zones and associated regulations, and management plan activities. Specifically, Alternative 1 encompasses 3,800 square miles, and includes 28 WMAs, 19 SPAs, 4 SUAs, 2 ERs, and 4 EMAs for a total of 57 marine zones.

Sanctuary boundary. In the no action alternative, the sanctuary boundary would not change and would continue to encompass 3,800 square miles.

Sanctuary-wide regulations. There would be no changes to existing sanctuary regulations at 15 C.F.R. part 922, subpart P.

Marine zones and associated regulations. There would be no changes to the 57 existing marine zones and their associated regulations.

Management plan. There would be no changes to the 2007 revised management plan.

Alternative 2

Alternative 2 proposes to reduce stressors and impacts to sanctuary and refuge resources. As compared to the no action alternative, Alternative 2 proposes a boundary expansion, updated and new sanctuary-wide regulations, modifications to existing marine zones, new marine zones, increased application of regulations in those marine zones, and an updated management plan.

Sanctuary boundary. Alternative 2 proposes to expand the sanctuary boundary to include the area to be avoided (ATBA) and to encompass the area in the Tortugas region between the existing sanctuary boundary and the Tortugas South ER. The sanctuary boundary in Alternative 2 encompasses 4,541 square miles.

Sanctuary-wide regulations. Alternative 2 includes updates to three existing sanctuary-wide regulations and proposes four new sanctuary-wide regulations. In general these proposed updated and new regulations provide NOAA additional authority to protect sanctuary resources, rapidly respond to impacts to sanctuary resources and, in some cases, create consistency with other sanctuary and state regulations.

Marine zones and associated regulations. The marine zones proposed in Alternative 2 are specifically designed to minimize conflicting and heavy concentrations of use. This alternative maintains many of the marine zones in the no action alternative and adds marine zones to provide additional, site-specific protection where resource damage is evident. In these new zones, it implements the least restrictive regulations to meet the resource protection goals set by the advisory council and the FKNMSPA. Alternative 2 includes a total of 96 marine zones.

Management plan. Alternative 2 includes an updated management plan with a vision, mission, goals, and associated objectives and activities designed to facilitate understanding of sanctuary resource condition and value that is applied to targeted management action, reduction of impacts to resources, and enhanced stewardship and collaboration.

Alternative 3 (preferred)

Alternative 3 is specifically designed to create a balance between resource protection and sustainable use with an even greater emphasis on resource protection than Alternative 2.

Sanctuary boundary. Alternative 3 includes the same proposed boundary changes as Alternative 2. The sanctuary boundary in Alternative 3 encompasses 4,541 square miles.

Sanctuary-wide regulations. Alternative 3 includes the same proposed sanctuary-wide regulation changes as Alternative 2. Alternative 3 also includes a non-regulatory update (which is also discussed in

Section 3.5 Management plan: Florida Keys National Marine Sanctuary) to provide additional coordination of live rock aquaculture activities.

Marine zones and associated regulations. Like Alternative 2, this alternative would maintain many of the existing marine zones in the no action alternative and also adds marine zones to provide additional, site-specific protection where resource damage is evident. However, Alternative 3 proposes to implement more protective regulations than would be implemented in Alternative 2. Specific marine zone regulations and access restrictions proposed in Alternative 3 allow a more resource protective strategy than those proposed in Alternative 2 and are less restrictive than those proposed in Alternative 4. Alternative 3 includes a total of 98 marine zones.

Management plan. Alternative 3 includes the same proposed updated management plan as Alternative 2.

Alternative 4

Alternative 4 is primarily designed to protect large contiguous habitats and applies the most protective regulations within individual marine zones.

Sanctuary boundary. Alternative 4 includes the same proposed boundary changes included in Alternatives 2 and 3, and includes a distinct unit at Pulley Ridge, an area of nationally significant mesophotic coral reefs with demonstrated connectivity to the Florida Keys. The sanctuary boundary in Alternative 4 encompasses 4,800 square miles.

Sanctuary-wide regulations. Alternative 4 includes the same proposed sanctuary-wide regulation changes as Alternative 2 and includes updates to two existing regulations: one to provide additional protection to all shorelines in the sanctuary, and the other to provide FKNMS with additional permitting authority over live rock aquaculture activities to manage potential impacts to sanctuary resources.

Marine zones and associated regulations. Alternative 4 strives to meet a balance between protecting site-specific locations where resource damage is evident while also protecting of the largest area of contiguous habitats compared to the other proposed alternatives. To do this, FKNMS proposes to combine some marine zones and include larger zones in each of the five geographic regions (Upper Keys, Middle Keys, Lower Keys, Marquesas, and Tortugas). This approach aims to more fully meet Goal 2 of the advisory council regulatory and zoning alternatives development workplan: *Protect large, contiguous, diverse, and interconnected habitats that provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life and protect and preserve all habitats and species.* The marine zone-specific regulations and access restrictions would be more protective in Alternative 4 than in any of the other proposed alternatives. Some of the zones in this alternative, including the Long Key/Tennessee Reef and Tortugas Spawning Corridor ERs, were discussed by the advisory council working groups but not included as part of their final recommendations to the advisory council. Alternative 4 includes a total of 98 marine zones.

Management plan. Alternative 4 includes the same proposed updated management plan as Alternative 2.

Summary of proposed modifications to the five management components within each alternative

As indicated above, each of NOAA’s alternatives describes proposed modifications to five specific components of FKNMS management (the sanctuary boundary, sanctuary-wide regulations, marine zone boundaries, marine zone regulations, and the management plan). Proposed modifications to each of these components are summarized below and in Table 3.1.

Table 3.1. Summary of five management components within each alternative (areas are approximate)

Components	Alternatives			
	Alternative 1 (no action)	Alternative 2	Alternative 3 (preferred)	Alternative 4
Sanctuary boundary (Section 3.1)	Alt. 1 (no action) 3,800 sq miles	Existing boundary ATBA Tortugas Region 4,541 sq miles	Existing boundary ATBA Tortugas Region 4,541 sq miles	Existing boundary ATBA Tortugas Region Pulley Ridge 4,800 sq miles
Sanctuary-wide regulations (Section 3.2)	Alt. 1 (no action)	Update 3 existing Propose 4 new	Update 4 existing Propose 4 new	Update 5 existing Propose 4 new
Marine zone boundaries ¹ (Section 3.3)	Alt. 1 (no action) 57 total zones 1033 sq miles	96 total zones 1129 sq miles	98 total zones 1141 sq miles	98 total zones 1433 sq miles ²
Additional marine zone regulations (Section 3.4)	Alt. 1 (no action)	Eliminate 2 exceptions Update 2 existing Apply more protective regulations than Alternative 1	Same as Alt. 2 or more protective (e.g., greater number of no entry areas)	Same as Alt. 2 or 3, or more protective (e.g., greater number of transit only areas)
Management plan (Section 3.5)	Alt. 1 (no action)	New proposed management plan	Same as Alternative 2	Same as Alternative 2

1. Marine zone numbers and area calculations include Great White Heron and Key West National Wildlife Refuges.
2. The area estimate includes the boundary expansion at Pulley Ridge due to the application of a proposed no anchor regulation.

3.1 Component 1 – Modifications to the sanctuary boundary by alternative

3.1.1 Alternative 1: No action (status quo)

For the no action alternative, the sanctuary boundary would continue to encompass 3,800 square miles (9,842 square km).

3.1.2 Alternative 2: Sanctuary expansion to encompass the area to be avoided and the Tortugas region

In Alternative 2, the sanctuary boundary would encompass a total area of 4,541 square miles (11,761 square km), which is an expansion of the sanctuary boundary by 741 square miles (1,919 square km).

Alternative 2 includes expansion of the sanctuary boundary to encompass 472 square miles (1,223 square km) of the area to be avoided (ATBA) that is currently outside the existing sanctuary boundary. The sanctuary boundary would be expanded in two locations to align with the regulatory ATBA boundary: (a) the area north of the existing sanctuary boundary and west of Biscayne National Park and (b) the area south of the existing sanctuary boundary.

The ATBA was originally proposed by the United States Coast Guard (USCG) (*see* 55 Fed. Reg. 19418) and was codified through the FKNMSPA in 1990 (Public Law 101-605, Nov. 16, 1990). The ATBA was added to FKNMS regulations in 1997 (62 Fed. Reg. 32161), and was slightly modified in 2001 (66 Fed. Reg. 34533). These regulations establish four ATBAs where operating a tank vessel or a vessel greater than 50 meters in registered length is prohibited. The ATBA boundary expansion proposes aligning the geographic boundary of the sanctuary with the existing ATBA boundaries. This proposed boundary expansion would clarify NOAA's area of responsibility and enhance compliance and enforcement.

Alternative 2 includes expansion of the sanctuary boundary to encompass 271 square miles (702 square km) of the Tortugas region. The expansion of sanctuary designation to adjacent and ecologically connected habitat in the Tortugas is evaluated for a number of reasons. In the Tortugas region, features and resources adjacent to the existing boundary would benefit from additional sanctuary-wide and targeted zone-specific protections. These include the important habitats and ecological features of Tortugas Bank that provide habitat for a host of species and support fish spawning aggregation activity. In addition, extending the sanctuary boundary to encompass the area between the existing boundary and Tortugas South ER would provide additional protections to this biologically significant area.

The expansion in the Tortugas Region aligns with the existing particularly sensitive sea area (PSSA), encompasses the Tortugas South ER, and extends to the west of the Tortugas South ER by one mile. The PSSA was established by the International Maritime Organization (IMO) in 2002. PSSAs are used to protect areas for special ecological, socioeconomic, or scientific reasons and that are vulnerable to damage by international maritime activities. This expansion provides additional protections for important ecological resources and the ecological connectivity in the region, particularly between Tortugas North and South ERs and Tortugas Bank. Existing sanctuary-wide regulations and proposed updated or new sanctuary-wide regulations as outlined in Section 3.2 would apply in this expanded area.

3.1.3 Alternative 3: Sanctuary expansion to encompass the area to be avoided and the Tortugas region (preferred)

For the sanctuary boundary alternatives, Alternative 3 is the same as Alternative 2. Alternative 3 is NOAA's preferred alternative. In Alternative 3, the sanctuary boundary would encompass a total area of 4,541 square miles (11,761 square km).

3.1.4 Alternative 4: Sanctuary expansion to encompass the area to be avoided, the Tortugas region, and Pulley Ridge

Alternative 4 includes the boundary expansion as proposed and described in Alternatives 2 and 3 and proposes to add a distinct unit at Pulley Ridge. Alternative 4 would expand the sanctuary boundary by 1,000 square miles (2,590 square km), resulting in a boundary that encompasses a total area of 4,800 square miles (12,432 square km). The expansion area would comprise 472 square miles (1,223 square km)

of ATBA area, 271 square miles (702 square km) of the Tortugas region area, and 259 square miles (670 square km) at Pulley Ridge.

Pulley Ridge is a nationally significant mesophotic reef ecosystem with demonstrated biological connectivity with the Florida Keys (Sponaugle and Cowen 2019). Potential sanctuary expansion to include a distinct unit at Pulley Ridge would provide additional and broader protections not currently afforded by existing management in the region. The proposed expansion would overlap with the existing GMFMC habitat area of particular concern (HAPC) (south portion and proposed south portion A). In the proposed Pulley Ridge boundary expansion, existing sanctuary-wide regulations and proposed updated or new sanctuary-wide regulations as outlined in Section 3.2 would apply. In addition, a no anchoring regulation for all vessels is proposed in the Pulley Ridge expansion area.

As noted, this expanded area is a GMFMC HAPC with associated regulations. Sanctuary expansion would not alter that designation or existing regulations.

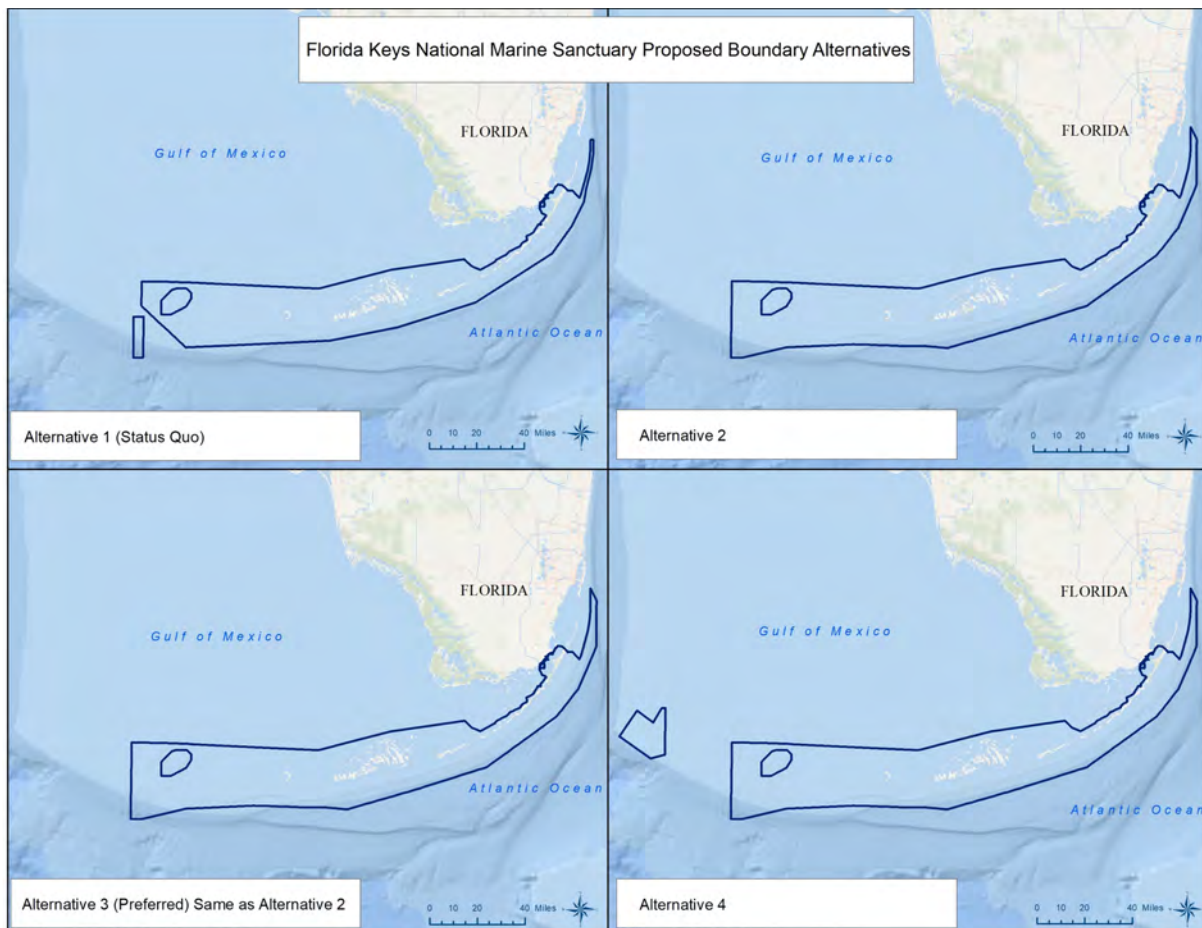


Figure 3.1. Sanctuary boundary: Map of alternatives (see Section 3.6 for more detailed maps). Image: NOAA

3.2 Component 2 – Modifications to sanctuary-wide regulations by alternative

Sanctuary-wide regulations are those that apply throughout the entire sanctuary, including within the sanctuary marine zones (see sections 3.3 and 3.4 for more details regarding additional marine zone-

specific regulations). The proposed modified and/or new sanctuary-wide regulations address issues related to access, the emergency regulation authority, the discharge regulation and associated exemptions, derelict vessels, and fish feeding. In addition, many of the proposed regulations would also have specific terms and definitions associated with them as described below.

NOAA is also proposing minor or technical revisions and updates to regulatory definitions, terms, and provisions. These changes are included in Appendix B and would apply across all alternatives except Alternative 1: No action.

For the complete text of existing sanctuary-wide regulations see 15 C.F.R. § 922.163 Prohibited activities—Sanctuary-wide.

3.2.1 Live rock prohibition update (proposed update)

Alternative 1: No action (status quo)

Alternative 1 would retain the existing FKNMS regulations, which currently prohibit removal of, injury to, or possession of coral or live rock, or harvesting, or attempting to harvest, any live rock from the sanctuary (15 C.F.R. § 922.163(a)(2)). There is an exception to this prohibition for live rock aquaculture activities permitted under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) regulations at 50 C.F.R. part 622 or permits/licenses issued by the Florida Department of Agriculture and Consumer Services (FDACS) for live rock aquaculture activities in state waters of the sanctuary.

Alternative 2

Alternative 2 would retain the existing regulation as described above in Alternative 1: No action.

Alternative 3 (preferred)

NOAA would not change the existing live rock prohibition under Alternative 3. However, NOAA recognizes that greater FKNMS oversight of these activities is needed and, as such, under Alternative 3, NOAA would

develop a memorandum of agreement / understanding with the state of Florida and National Marine Fisheries Service for management and permitting of live rock aquaculture activities in the sanctuary.

While this would be a programmatic management plan activity (as opposed to a regulatory change), it is included here to provide the reader the full list of proposed alternatives related to live rock aquaculture. For more details of this management plan activity, see Section 3.5.

Alternative 4

Under Alternative 4, NOAA would update the live rock prohibition by modifying the existing exception for permitted live rock aquaculture activities. The revised regulation would

require sanctuary authorization for existing and any future live rock aquaculture activities inside the boundary of the sanctuary.

With this proposed update, NOAA would require anyone with an existing or future live rock aquaculture lease from the state of Florida or permit from NMFS to also hold a FKNMS authorization. As of 2018, 19 individuals hold state leases and 19 individuals hold federal permits for live rock aquaculture sites within FKNMS. Sanctuary authorizations issued to the existing and potential future permit holders could include

additional conditions designed to protect sanctuary resources to the greatest extent possible while still allowing compatible aquaculture activities to occur.

Under Alternative 4, current and future live rock aquaculture operators within the sanctuary would be required to obtain an authorization from ONMS per 15 C.F.R. § 922.163(c) and 15 C.F.R. § 922.49 to be in compliance with FKNMS regulations. The proposed update in regulation would provide consistency with other types of activities that are prohibited but may be allowed under permit or authorization, such as research and restoration actions involving corals, and placement of equipment on the seafloor for aquaculture purposes (e.g., coral nursery structures). In addition, the proposed update would better enable FKNMS to address activities that might otherwise be inconsistent with FKNMS goals and objectives, complicate enforcement, and/or lead to illegal poaching of corals. FKNMS would craft specific terms and conditions designed to further protect sanctuary resources to the greatest extent possible while allowing compatible aquaculture activities to occur.

3.2.2 Discharge regulation exception (proposed update)

Sanctuary discharge prohibitions are necessary to protect sanctuary resources and the condition of those resources from the effects of pollutants associated with discharges.

Alternative 1: No action (status quo)

Existing FKNMS regulations currently prohibit discharging or depositing materials or other matter within the boundary of the sanctuary (15 C.F.R. § 922.163(a)(4)). Exceptions include discharging or depositing: (1) fish, fish parts, chumming materials, or bait during traditional fishing activities; (2) water generated by routine vessel operations (e.g., graywater as defined in section 312 of the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act (CWA)), excluding oily wastes from bilge pumping; and (3) vessel cooling water or engine exhaust. In certain protected zones, including ERs, SPAs, and SUAs, NOAA only allows discharges from engine exhaust and cooling water. In 2010, NOAA amended FKNMS regulations to eliminate the former exception for discharges of biodegradable effluent incidental to vessel use and generated by marine sanitation devices approved under the CWA.

Alternative 2

Under Alternative 2, NOAA would update the existing exceptions for discharge from vessels to prohibit discharge of certain materials from cruise ships while inside the sanctuary boundary. The revised regulation would

prohibit discharge of any material or other matter from a cruise ship except clean vessel engine cooling water, clean vessel generator cooling water, vessel engine or generator exhaust gas, clean bilge water, or clean anchor wash water.

This proposed update would increase protection of water quality and sanctuary resources from pollutants present in cruise ship discharges, such as graywater, scrubber wash water, and other discharges that occur during vessel operations. This proposed update would be effective throughout the entire sanctuary, in both state and federal waters. This update would make FKNMS regulations consistent with those of other sanctuary sites.

In conjunction with this proposed prohibition, a new definition for “cruise ship” would be added to the regulations to clarify the specific applicability of this prohibition. The revised regulation would define

Cruise ship means a vessel for hire with 250 or more passenger berths.

Alternative 3 (preferred)

Alternative 3 is the same as Alternative 2. Alternative 3 is NOAA’s preferred alternative.

Alternative 4

Alternative 4 is the same as Alternative 2.

3.2.3 Shoreline slow speed (proposed update)

Alternative 1: No action (status quo)

Existing sanctuary-wide regulations include regulations (15 C.F.R. § 922.163(a)(5)(iii)(D)) that prohibit operating a vessel at a speed greater than 4 knots or in a manner which creates a wake within 100 yards of residential shorelines. These regulations do not apply within officially marked navigation channels.

Alternative 2

Alternative 2 would retain the existing regulation as described above in Alternative 1: No action.

Alternative 3 (preferred)

Alternative 3 would retain the existing regulation as described above in Alternative 1: No action. Alternative 3 is NOAA’s preferred alternative.

Alternative 4

To address impacts to shallow water habitats and dependent wildlife, primarily including nesting, roosting, and foraging bird species, NOAA would update the sanctuary-wide regulation regarding idle speed/no wake within 100 yards of residential shorelines so that it would require “slow speed” and apply to all shorelines within the sanctuary.

The proposed updated sanctuary-wide regulation would prohibit the following:

Operating a vessel on plane or in a manner that creates an extensive wake within 100 yards of all shorelines.

This proposed regulation would maintain the existing exception and would not apply in officially marked navigation channels.

In conjunction with this proposed prohibition, a new definition for “slow speed” would be added to the regulations to clarify the specific applicability of this prohibition, as follows:

Slow speed means that a vessel must be fully off plane and completely settled into the water. The vessel must then proceed at a speed which is reasonable and prudent under the prevailing circumstances so as to avoid the creation of an excessive wake or other hazardous condition which endangers or is likely to endanger other vessels or other persons using the waterway. Due to the different speeds at which vessels of different sizes and configurations may travel while in compliance with this definition, there is no specific numerical speed assigned to slow speed. Vessels that would not meet this slow speed regulation include vessels:

- (a) *Operating on plane;*

(b) In the process of coming off-plane and settling into the water or coming up onto plane; or

(c) Operating at a speed that creates an excessive wake or other hazardous condition which unreasonably or unnecessarily endangers other vessels or other persons using the waterway, or is likely to do so.

This definition is informed by and consistent with state of Florida definitions 68C-22.002 Florida Administrative Code.

3.2.4 Emergency regulations (proposed update)

Emergency regulations allow the sanctuary to respond to emergencies and unforeseen impacts to sanctuary resources to prevent or minimize the destruction of, loss of, or injury to a sanctuary resource or quality.

Alternative 1: No action (status quo)

The existing FKNMS emergency regulation outlined at 15 C.F.R. § 922.165 allows a temporary regulation to be in effect for up to 60 days, with one 60-day extension. Additional extended action requires notice and comment rulemaking under the Administrative Procedures Act.

In addition to the emergency regulation authority, NOAA has the authority to modify the number or location of access restrictions within marine portions of wildlife management areas (15 C.F.R. § 922.164(c)(4)), to temporarily restrict access to portions of SPAs or ERs (15 C.F.R. § 922.164(d)(2)), and to modify the number, location, or designations applicable to SUAs (15 C.F.R. § 922.164(e)(4)). These regulations provide for flexible and adaptive management response to unforeseen impacts to sanctuary resources to prevent or minimize the disturbance, destruction, loss of, or injury to a sanctuary resource or quality. Examples of resource management issues that may require rapid response and intervention include coral bleaching, disease, weather impacts, invasive species, or specific impacts from intense or concentrated human activities.

FKNMS has implemented emergency regulations on three separate occasions. In 1997, the emergency regulation was used to prohibit anchoring of vessels 50 meters or greater in an area of Tortugas Bank, which was shown to have caused significant injury to living coral resources in that area. This temporary prohibition later went through notice and comment rulemaking, including consultation with and approval by the governor of Florida, to become a final rule in August 1998.

In 2002, an area of approximately 0.58 acres was identified as an area to avoid for a period of 45 days (May 15 to June 28), which was then extended for an additional 49 days (June 28 to August 15), due to the presence of heavy construction equipment and to ensure timely and safe restoration activities at the M/V *Wellwood* grounding site. The additional closure days were needed due to poor weather impacting the sanctuary's ability to complete restoration activities in the first time period. In 2003, two areas totaling 425 acres were closed for a period of 60 days (June 26 to August 25) to prevent additional injury to living coral in an area impacted by a rapidly spreading coral disease outbreak.

Similarly, USFWS has authority to close or restrict access to areas within the Florida Keys National Wildlife Refuge Complex to protect federal trust resources, specifically those areas above the mean high water line where USFWS has exclusive jurisdiction. The Backcountry Management Plan and associated cooperative agreement between the state of Florida and USFWS governs mutually agreed upon

regulations within the backcountry state-owned sovereign submerged lands within Key West National Wildlife Refuge and Great White Heron National Wildlife Refuge.

Alternative 2

Sanctuary-wide emergency regulation

Under Alternative 2, NOAA would update the existing emergency regulation (15 C.F.R. § 922.165) to strengthen the sanctuary's ability to more rapidly and flexibly respond to threats impacting sanctuary resources. The proposed regulation would allow

a temporary regulation to be in effect for up to six months (180 days), with one six-month (additional 186-day) extension.

This proposed update would not change the requirement for public notice and comment rulemaking under the Administrative Procedures Act for any actions that extend beyond these timelines. This proposed update is intended to provide NOAA sufficient time to conduct the necessary review and public notice if a rulemaking process is deemed necessary.

Sanctuary marine zone emergency regulations

In addition to the above proposed update to the emergency regulation, NOAA proposes to eliminate the marine zone-specific emergency regulations.

The sanctuary-wide emergency regulation update would provide the management and response flexibility that the existing marine zone-specific regulations allow and would also result in more consistent application, implementation, and public notice requirements. The following marine zone-specific regulations would be eliminated:

wildlife management areas (15 C.F.R. § 922.164(c)(4)),

sanctuary preservation areas or ecological reserves (15 C.F.R. § 922.164(d)(2)), and

special use areas (15 C.F.R. § 922.164(e)(4)).

Proposed updates to the emergency regulation and elimination of the marine zone-specific regulations would be consistent with and are intended to meet the advisory council work-plan Item 5: permit procedures and adaptive management. This update to existing regulations would be in direct response to the advisory council's request that the sanctuary: (1) identify potential resource threats needing rapid management responses not available in the existing regulatory framework, (2) develop, modify, or insert regulatory language to better respond to management challenges or resource protection issues, (3) develop a research and monitoring component to feed adaptive management measures, and (4) allow greater flexibility in modifying zones to address changing resource management needs. For more information on advisory council recommendations related to developing an adaptive management framework see <https://floridakeys.noaa.gov/review/adaptive.html>.

Alternative 3 (preferred)

Alternative 3 is the same as Alternative 2. Alternative 3 is NOAA's preferred alternative.

Alternative 4

Alternative 4 is the same as Alternative 2.

3.2.5 Historical resources permit categories (proposed update)

Alternative 1: No action (status quo)

The current permit categories for activities involving historical resources include survey/inventory of historical resources, research/recovery of historical resources, and deaccession/transfer of historical resources. Since implementation of the initial 1996 FKNMS management plan, 61 unique historical resource projects have been granted a survey/inventory or research/recovery of historical resources permit. No deaccession/transfer permits have been applied for or issued. Existing historical resources permit requirements are available at 15 C.F.R. § 922.166(b), (c), and (d).

Alternative 2

Based on more than 30 years of historical resource management, issuance of dozens of historical resource permits and evaluation of the efforts of the permittees towards meeting NOAA's stewardship goals, NOAA has determined that the historical resources permitting process needs revision to improve resource protection and more closely align NOAA permitting regulations with those of the Florida Department of State Division of Historical Resources (DHR) and the Federal Archaeological Program. In consideration of the sensitive non-renewable character of historical resources and the shared stewardship responsibilities of NOAA and Florida DHR, NOAA would modify the historical resources permit categories as follows:

Eliminate the survey/inventory, research/recovery, and deaccession/transfer of historical resources permit categories and replace them with a single archaeological research permit category that is consistent with the standards and procedures implemented by Chapter 1A-32, Florida Administrative Code, for Archaeological Research on State Lands in Florida.

With 60 percent of the sanctuary lying within state waters, NOAA seeks to reconcile its standards for archaeological research permits by adopting those used by DHR. NOAA believes aligning its permit processes with that of DHR would improve the quality and reporting of historical resource research projects undertaken in the sanctuary, further aiding NOAA with its conservation mandates and advancing interpretation of sanctuary historical resources to the public.

In conjunction with this proposed prohibition, a new definition for “archaeological research” would be added to the regulations to clarify the specific applicability of this prohibition, as follows:

Archaeological research means scientific study of the physical remains of human activity and its surrounding environmental context utilizing research questions to inform society's understanding of the past.

This definition is informed by and consistent with the state's 1A-32 archaeological research permit standards and with the Secretary of the Department of Interior's Standards for Archeological Documentation.

In conjunction with this proposed change, the Office of National Marine Sanctuaries Instructions for Submitting Applications for National Marine Sanctuary Permits and Authorizations, Appendix G Florida Keys National Marine Sanctuary Archeological Research Permits would be updated.

In addition, NOAA is drafting a new programmatic agreement with DHR and the Advisory Council on Historic Preservation (ACHP) to help NOAA fulfill its responsibilities under Section 106 of the National Historic Preservation Act (54 U.S.C. § 306108). The signatory parties to the agreement would include NOAA's FKNMS, ACHP, and the Florida State Historic Preservation Office (SHPO). A draft of the programmatic agreement, available in Appendix C, outlines the process the parties would follow to meet their legal obligations under Section 106 of the National Historic Preservation Act, and to manage historical resources within the sanctuary. Through publication of this DEIS, NOAA invites public comment on the proposed draft programmatic agreement in Appendix C.

Alternative 3 (preferred)

Alternative 3 is the same as Alternative 2. Alternative 3 is NOAA's preferred alternative.

Alternative 4

Alternative 4 is the same as Alternative 2.

3.2.6 Fish feeding regulation (proposed new)

Fish feeding is a common practice in the Florida Keys and is conducted at various locations including from shore, from boats, and by divers and snorkelers. Fish feeding is generally conducted in order to attract fish. This practice has resulted in human safety issues and has been shown to alter fish behavior (Milazzo 2006).

Alternative 1: No action (status quo)

Existing FKNMS regulations for discharges within the sanctuary boundary do not explicitly or adequately address activities associated with feeding fish, sharks, or other marine life species from vessels or by divers. Existing FKNMS discharge regulations include an exception for discharging fish, fish parts, chumming materials, or bait used incidental to and only while conducting a traditional fishing activity (15 C.F.R. § 922.163(a)(4)). Existing Florida rule at 68B-5.005 Florida Administrative Code prohibits: (1) divers from engaging in the practice of fish feeding, and (2) anyone from operating any vessel for hire for the purpose of carrying passengers to any site in the saltwaters of the state to engage in fish feeding or to allow such passengers to observe fish feeding. This state regulation does not currently extend into the federal waters of the sanctuary.

Alternative 2

NOAA is proposing a new regulation to explicitly address fish feeding and its threat to sanctuary resources. This new proposed regulation would clarify prohibitions specific to the practice of fish feeding.

To address the potential impact that the feeding of fish, sharks, or other marine species poses for human safety, the environment, and changes in behavior of such species, NOAA would update its regulations to

prohibit the feeding of fish, sharks, or other marine species from any vessel and/or while diving.

The proposed regulation would not affect the existing exemption which allows discharge of fish, fish parts, chumming materials, or bait used incidental to and only while conducting a traditional fishing activity in the sanctuary.

In conjunction with this proposed prohibition, the following definitions would be added to the regulations to clarify the specific applicability of this regulation.

Feeding means offering, giving, or attempting to give any food or other substance to fish, sharks, or other marine species except for the purpose of harvesting such marine species as otherwise allowed by state and federal law.

Diving means any person who is wholly or partially submerged in the water and is equipped with a face mask, face mask and snorkel, or underwater breathing apparatus. (Note: this definition is consistent with Florida law at 68B-5.005 Florida Administrative Code).

For this proposed prohibition, the sanctuary's existing definitions of "fish" and "vessel" would apply, and a revised definition of "traditional fishing" that provides additional clarity and specificity for what is intended would apply (see below).

Fish means finfish, mollusks, crustaceans, and all forms of marine animal and plant life other than marine mammals and birds.

Vessel means a watercraft of any description, including, but not limited to, motorized and non-motorized watercraft, personal watercraft, airboats, and float planes while maneuvering on the water, capable of being used as a means of transportation in/on the waters of the sanctuary.

Traditional fishing means those commercial or recreational fishing activities that were customarily conducted within the sanctuary prior to its designation as identified in the environmental impact statement and management plan (EIS/MP) for this sanctuary, as managed by the appropriate federal (National Marine Fisheries Service in coordination with South Atlantic Fishery Management Council, Gulf of Mexico Fishery Management Council) and state (Florida Fish and Wildlife Conservation Commission) agencies. Traditional fishing does not include use of novel or new gear types to catch species that were fished by other means as identified in the EIS/MP; does not include use of gear types (modified or not) identified in the EIS/MP to catch species those gear types were not originally intended to catch; or does not include use of gear or harvest of species outside of the seasons/time of year identified in the EIS/MP.

Alternative 3 (preferred)

Alternative 3 is the same as Alternative 2. Alternative 3 is NOAA's preferred alternative.

Alternative 4

Alternative 4 is the same as Alternative 2.

3.2.7 Vessel groundings and derelict and deserted vessels (proposed new)

Derelict and deserted vessels are an ongoing and persistent threat to the marine environment of the Florida Keys.

Alternative 1: No action (status quo)

Currently, removal of grounded derelict or deserted vessels and the harmful matter aboard such vessels (e.g., motor oil, fishing gear that could cause entanglement) is not specifically required unless a discharge

has occurred, the vessel or harmful matter has altered the seabed, or the vessel or harmful matter resulted in the destruction, loss, or injury to a sanctuary resource. Existing FKNMS regulations do not include a requirement to provide notice of a grounded vessel to the sanctuary.

Alternative 2

To address concerns regarding the potential threats to the marine environment from derelict or deserted vessels and to require vessel owners to take care of deserted vessels before they become grounded and cause damage, NOAA would:

prohibit anchoring, mooring, or occupying a vessel at risk of becoming derelict, or deserting a vessel aground, at anchor, or adrift in the sanctuary.

This proposed new regulation would be consistent with other national marine sanctuary regulations (*see* 15 C.F.R. §§ 922.81 and 922.131) and Section 823.11 Florida Statutes. When implementing this proposed regulation, NOAA would take into consideration the criteria outlined in Section 327.4107 Florida Statutes: “Vessels at risk of becoming derelict on waters of [the] state.”

In conjunction with this proposed prohibition, new definitions for “at risk” and “deserting” would be added to the regulations to clarify the specific applicability of this prohibition.

Consistent with definitions applicable in other national marine sanctuaries:

Deserting means leaving a vessel aground or adrift without notification to the director of the vessel going aground or becoming adrift within 24 hours of its discovery and developing and presenting to the director a preliminary salvage plan within 72 hours of such notification, after expressing or otherwise manifesting intention not to undertake or to cease salvage efforts, or when the owner/operator cannot after reasonable efforts by the director be reached within 24 hours of the vessel’s condition being reported to authorities; or leaving a vessel at anchor when its condition creates potential for a grounding, discharge, or deposit and the owner/operator fails to secure the vessel in a timely manner.

The 24-hour and 72-hour timeframes for responding to vessel grounding incidents are consistent with Section 403.93345 Florida Statutes, “Florida Coral Reef Protection Act.”

Once a vessel is grounded there is a high risk of discharge of harmful matter into the marine environment. Currently, removal of harmful substances (e.g., motor oil, gear that could cause entanglement) is not specifically required unless a discharge has occurred. Therefore, NOAA is proposing to

prohibit leaving harmful matter aboard a grounded or deserted vessel in the sanctuary.

In conjunction with this proposed prohibition, a new definition of “harmful matter” would be added to the regulations to clarify the specific applicability of this prohibition.

Harmful matter means any substance or combination of substances that, because of its quantity, concentration, or physical, chemical, or infectious characteristics, may pose a present or potential threat to FKNMS resources or qualities.

These substances include, but are not limited to, fishing nets, fishing line, hooks, fuel, oil, and those contaminants (regardless of quantity) listed pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, 42 U.S.C. § 9601) at 40 C.F.R. § 302.4.

These new regulatory provisions would help reduce or avoid harm to FKNMS resources from derelict vessels as a result of direct impacts from the settling or colliding of a vessel on habitats and potential leakage of harmful matter from a vessel. NOAA would have the authority to enforce removal of deserted vessels to prevent potential groundings, collisions, or discharge of harmful materials that could harm FKNMS resources. Under existing authorities, vessel owners can be held liable for groundings and associated fuel spills that violate seabed disturbance or discharge regulations. The main purpose of the proposed regulations is to facilitate response activities and make enforcement easier.

Once a vessel is grounded, removal and salvage of the vessel is necessary. Currently, there are no guidelines or regulations specific to towing and salvage operations in sanctuary waters. Therefore, NOAA would work with the towing and salvage industry to develop a suite of guidelines and best practices and apply the existing sanctuary general permit category to certain towing and salvage operations. See Section 3.5 for more details.

Alternative 3 (preferred)

Alternative 3 is the same as Alternative 2. Alternative 3 is NOAA's preferred alternative.

Alternative 4

Alternative 4 is the same as Alternative 2.

3.2.8 Large vessel mooring buoy regulation (proposed new)

Mooring buoys serve as an important management tool in FKNMS, providing boaters the ability to moor their vessel safely and avoid damaging coral reefs and other important ecosystems. However, mooring buoy use by large vessels has been shown to damage the mooring buoy anchoring hardware and in some cases the substrate to which the hardware is secured.

Alternative 1: No action (status quo)

Existing FKNMS regulations do not include regulations specific to vessel size and mooring buoy requirements. Current restrictions of marker and mooring buoys include a prohibition on damaging or removing markers, including mooring buoys (15 C.F.R. § 922.163(a)(8)).

Alternative 2

NOAA is proposing a new regulation that would prevent mooring buoy damage by requiring vessels of a certain length to use mooring buoys of a specific size:

Require vessels over 65' length overall to use large vessel designated FKNMS mooring buoys.

Require vessels under 65' length overall to use small designated FKNMS mooring buoys.

This proposed regulation would also apply to vessels rafting up to one another on a single mooring buoy if their combined length is or would be equal to or greater than 65' length overall. In conjunction with this prohibition, NOAA would designate specific "large vessel only" (65' length overall) mooring buoys in areas frequented by large vessels, which would facilitate compliance with this proposed new regulation

and ensure mooring buoy availability for both small and large vessels. Vessels less than 65' length overall would not be permitted to use the mooring buoys designated for large vessels. NOAA would work with various user groups to ensure that an adequate number of small and large vessel mooring buoys would be available and placed at appropriate locations.

In conjunction with this proposed prohibition, a new definition for “large vessel” would be added to the regulations to clarify the specific applicability of this prohibition.

Large vessel means a vessel greater than 65' length overall, or the combined lengths of more than one vessel if, when tied together, the vessels are or would be greater than 65' length overall.

Alternative 3 (preferred)

Alternative 3 is the same as Alternative 2. Alternative 3 is NOAA's preferred alternative.

Alternative 4

Alternative 4 is the same as Alternative 2.

3.2.9 Overnight use of mooring buoys regulation (proposed new)

As noted above, mooring buoys serve as an important management tool in FKNMS providing boaters the ability to moor their vessels safely and avoid damaging coral reefs and other important ecosystems. Mooring buoys are currently provided as a free service to the many boaters that visit the Florida Keys every year and are available on a first come, first serve basis. There has been a recent increase in overnight use of FKNMS mooring buoys by individuals using commercial and/or private services that provide overnight lodging rentals. Longer duration and overnight use of mooring buoys has the potential for individuals to unfairly monopolize and monetize a government resource in the sanctuary. Mooring buoys are intended to increase accessibility while reducing impact to critical and sensitive natural resources. Longer term and overnight use of mooring buoys can also provide access and opportunity for an individual to illegally take natural resources (e.g., fish, invertebrates) from marine zones (where many mooring buoys are located) with less potential oversight from other boaters and enforcement officers.

Alternative 1: No action (status quo)

Existing FKNMS regulations do not include regulations specific to overnight use of mooring buoys.

Alternative 2

To facilitate equitable access to the mooring buoys and ensure compliance with sanctuary rules while at mooring buoys, NOAA is proposing a new regulation that would prohibit overnight use of FKNMS's mooring buoy systems:

Prohibit overnight use of any designated FKNMS mooring buoys.

An exception to this regulation would apply to vessels seeking safe harbor and to vessels permitted to use mooring buoys in Tortugas North ER.

Alternative 3 (preferred)

Alternative 3 is the same as Alternative 2. Alternative 3, is NOAA's preferred alternative.

Alternative 4

Alternative 4 is the same as Alternative 2.

Table 3.2. Sanctuary-wide regulations: Summary of alternatives

Regulation Title	Alternative 1 (No action: status quo)	Alternative 2	Alternative 3 (preferred)	Alternative 4
3.2.1 Live rock aquaculture	<p>No Action: Current regulation, 15 C.F.R. § 922.163(a)(2)(ii): Prohibits harvesting, or attempting to harvest, any live rock from the sanctuary, or possessing (regardless of where taken from) any live rock within the sanctuary, except as authorized by a permit for the possession or harvest from aquaculture operations in the Exclusive Economic Zone, issued by the National Marine Fisheries Service pursuant to applicable regulations under the appropriate Fishery Management Plan, or as authorized by the applicable state authority of competent jurisdiction within the sanctuary for live rock cultured on state submerged lands leased from the state of Florida, pursuant to applicable state law.</p>	Same as Alternative 1	Retain existing regulation, and develop a memorandum of agreement/understanding with the state of Florida and National Marine Fisheries Service for management and permitting of live rock aquaculture activities in the sanctuary. This is a management plan activity; see Section 3.5 for details.	Require sanctuary authorization for existing and any future live rock aquaculture activities.
3.2.2 Discharge regulation exception update	<p>No action: Current regulation, 15 C.F.R. § 922.163(a)(4): Prohibits. (i) Discharging or depositing, from within the boundaries of the sanctuary, any material or other matter, except (B) water generated by routine vessel operations (e.g., deck wash down and graywater as defined in section 312 of the</p>	Prohibit discharge of any material or other matter from a cruise ship except clean vessel engine cooling water, clean vessel generator cooling water, vessel engine or generator exhaust gas, clean bilge water, or clean anchor wash water.	Same as Alternative 2	Same as Alternative 2

	FWPCA), excluding oily wastes from bilge pumping.			
3.2.3 Shoreline slow speed zone	No action: Current regulation, 15 C.F.R. § 922.163(a)(5): Prohibits (iii) Except in officially marked channels, operating a vessel at a speed greater than 4 knots or in a manner which creates a wake: (D) within 100 yards of residential shorelines.	Same as Alternative 1	Same as Alternative 1	Extend this prohibition to apply to all shorelines within the sanctuary and modify the restriction to slow speed.
3.2.4 Emergency regulation	No action: Current regulation, 15 C.F.R. § 922.165: A temporary regulation to be in effect for up to 60 days, with one 60-day extension.	A temporary regulation to be in effect for up to six months (180 days), with one six month (additional 186 day) extension. Eliminate zone specific emergency regulations.	Same as Alternative 2	Same as Alternative 2
3.2.5 Historical resources	No action: The current permit categories for activities involving historical resources include survey/inventory of historical resources, research/recovery of historical resources, and deaccession/transfer of historical resources.	Eliminate the survey/inventory, research/recovery, and deaccession/transfer of historical resources permit categories and replace them with a single archaeological research permit category that is consistent with the standards and procedures implemented by Chapter 1A-32, Florida Administrative Code, for Archaeological Research on State Lands in Florida.	Same as Alternative 2	Same as Alternative 2
3.2.6 Fish feeding	No action: Currently not explicitly regulated unless such action results in discharge, or	Prohibit the feeding of fish, sharks, or other marine species from any vessel and/or while diving.	Same as Alternative 2	Same as Alternative 2

	destruction, loss, or injury to a sanctuary resource.			
3.2.7 Vessel grounding, deserted vessels, and abandoning gear	No action: Currently not explicitly regulated unless such action results in discharge, alteration to the seabed, or destruction, loss, or injury to a sanctuary resource.	Prohibit anchoring, mooring, or occupying a vessel at risk of becoming derelict, or deserting a vessel aground, at anchor, or adrift in the sanctuary.	Same as Alternative 2	Same as Alternative 2
		Prohibit leaving harmful matter aboard a grounded or deserted vessel in the sanctuary.	Same as Alternative 2	Same as Alternative 2
3.2.8 Large vessel mooring buoy	No action: Currently not regulated.	Require vessels over 65' length overall to use large vessel designated FKNMS mooring buoys. Require vessels under 65' length overall to use small designated FKNMS mooring buoys.	Same as Alternative 2	Same as Alternative 2
3.2.9 Overnight use of mooring buoys	No action: Currently not regulated.	Prohibit overnight use of FKNMS mooring buoys, except for safe harbor.	Same as Alternative 2	Same as Alternative 2

3.3 Component 3 – Proposed modifications to marine zone boundaries by alternative

NOAA is evaluating alternatives that revise existing and establish new marine zone designations for many reasons. Since the original sanctuary management plan, regulations, and marine zone designation in 1997, much has changed in relation to specific habitats and marine species that could benefit from modified or enhanced marine zone designation. Marine zone designation could: provide additional conservation protections for significant and sensitive habitats, including seven federally listed coral species protected under the ESA; facilitate important research opportunities to advance the science of coral reef ecosystem restoration and recovery; and protect large contiguous habitats that serve as natural spawning and nursery sites and permanent residence areas for many marine species. There is also a need to minimize and mitigate threats to habitats and species as a result of heavy, concentrated, and conflicting uses. Targeted marine zone designation could allow sustainable use while also separating conflicting uses and managing high intensity and concentrated use activities. Additionally, there is a need to simplify and, where possible, make the marine zone regulations and access restrictions consistent within each zone type and with state of Florida regulations and practice.

The marine zone alternatives are presented slightly differently than other alternative components in this chapter. Each alternative includes all zone types so the alternative description below is presented as a package of complementary marine zones (e.g., WMAs, SPAs, etc.) for each alternative, rather than presenting each zone type and its alternatives individually (e.g., all WMAs alternatives together). For a description of the purpose of each zone type, see 3.3.1.

Alternative 1 is the no action alternative and represents no change in the current FKNMS marine zones.

Alternative 2 provides additional targeted protection to resources not sufficiently protected by the existing marine zones and/or areas with degraded or impacted resources to facilitate recovery. Alternative 2 places greater emphasis on allowing sustainable public use and is specifically designed to minimize conflicting and heavy concentrations of use in the proposed marine zones while still allowing a relatively high level of overall use.

Alternative 3 places greater emphasis on resource protection in sensitive areas and applies greater access restrictions in those areas. This alternative proposes to establish limited use areas to further promote sustainable use and test the effectiveness of limited use areas in the sanctuary. Alternative 3 is NOAA's preferred alternative.

Alternative 4 provides the greatest level of protection for targeted site-specific locations where resource damage is evident while also protecting the largest area of contiguous habitats compared to the other three alternatives. Under Alternative 4, some marine zones would be combined and new larger zones would be included in each of the five geographic regions (Upper Keys, Middle Keys, Lower Keys, Marquesas, and Tortugas). This approach aims to more fully meet Goal 2 of the advisory council regulatory and zoning alternatives development workplan to *protect large, contiguous, diverse, and interconnected habitats that provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life and protect and preserve all habitats and species*. This alternative includes the greatest conservation protection measures and most restrictive public access recommendations in comparison to the other three alternatives.

Summary tables for each marine zone alternative are included at the end of this section.

See Section 3.6: Boundary and marine zone maps for individual marine zone maps that includes a description of the area and shows boundary options and regulations applied across the four alternatives.

Marine zones types – Background

Currently, FKNMS has five distinct marine zone types, each with a specific resource management goal as outlined below:

- (1) Wildlife management areas: protect shallow water habitats and wildlife that are dependent on those and other nearshore habitats;
- (2) Sanctuary preservation areas: protect significant patch and fore-reef coral reef areas, limit consumptive activities, and separate users engaged in conflicting activities;
- (3) Ecological reserves: protect larger contiguous habitats, which include a wide range of habitats including shallow water seagrass, hardbottom, and coral reefs that support life cycle needs of marine wildlife (e.g., spawning sites, nursery habitat, etc.); and
- (4) Special use areas: an umbrella category of marine zones that can be applied for specific management goals including:
 - Recovery area;
 - Restoration area;
 - Research-only area; and
 - Facilitated-use area.

Currently, the only special use area type in FKNMS is the research-only area. All of these research-only areas are located in coral reef areas, and were established to limit use and allow scientists to differentiate between impacts caused by use and those caused by changing environmental conditions.

Note that for all but the no action alternative, the existing SUA and ER zone types are proposed to be combined into one zone type called “conservation area”.

- (5) Existing management area: management areas that existed at the time of FKNMS designation and include Key Largo National Marine Sanctuary (Key Largo EMA), Looe Key National Marine Sanctuary (Looe Key EMA), and the national wildlife refuges, each with associated regulations at 15 C.F.R. § 922.164(b).

In addition to protecting habitats and ecosystems, each marine zone has associated regulations designed to meet the stated purpose of the marine zone type and specific resource protection goals at each location (see 15 C.F.R. § 922.164).

3.3.1 Marine zones within Alternative 1 (status quo)

Wildlife management areas (Alternative 1, no action)

In the no action alternative, there are 28 existing WMAs, 20 of which are within the boundary and jurisdiction of the USFWS Florida Keys National Wildlife Refuge Complex. NOAA is including the

Tortugas Bank No Anchor Zone area in this zone type category as the regulations are similar to other WMAs.

For a full list of existing WMAs and associated marine zone-specific regulations, see 15 C.F.R. § 922.164(c) and Appendix III to Subpart P of Part 922.

Sanctuary preservation areas (Alternative 1, no action)

In the no action alternative, there are 19 existing SPAs. Although Western Sambo ER is categorized as an ER, NOAA is including it in this zone type category as the regulations are similar to other SPAs.

For a full list of existing SPAs and associated regulations, see 15 C.F.R. § 922.164(d) and Appendix V to Subpart P of Part 922.

Ecological reserves (Alternative 1, no action)

In the no action alternative, there are 2 existing ERs, Tortugas North and South, which are both transit only. However, Tortugas North has a specific regulation that allows access with a Tortugas North access permit. While Western Sambo is categorized as an ER, regulations within this zone are similar to a SPA and NOAA is not including it in this zone type category. ER are intended to protect large contiguous habitats including those habitats necessary to support the full life cycle of a range of species.

For a full list of existing ERs and associated site specific regulations, see 15 C.F.R. § 922.164(d) and Appendix IV to Subpart P of Part 922.

Special use areas (Alternative 1, no action)

In the no action alternative, current FKNMS regulations allow for four types of SUAs: recovery area, restoration area, research-only area, and facilitated-use area. However, only one type of SUA – research-only area – is currently used. There are four existing SUA research-only areas, all of which are in coral reef habitat and are transit-only with certain activities allowed by permit.

For a full list of existing SUAs and their associated site specific regulations, see 15 C.F.R. § 922.164(e) and Appendix VI to Subpart P of Part 922.

Existing management areas (Alternative 1, no action)

In the no action alternative, there are four areas referred to as EMAs. EMAs are those areas that existed when FKNMS was designated in 1990. These include Key Largo EMA, Looe Key EMA, and the Florida Keys National Wildlife Complex Refuges.

Note that for all but the no action alternative, the existing EMA zone type name would no longer be used (i.e., Looe Key and Key Largo would be referred to as management areas and the national wildlife refuges would simply be referred to as national wildlife refuges rather than an existing management area).

For a full list of existing EMAs and associated site specific regulations, see 15 C.F.R. § 922.164(b) and Appendix II to Subpart P of Part 922.

3.3.2 Modifications to marine zones within Alternative 2

Marine zones included in Alternative 2 would provide additional targeted protections to areas with demonstrated natural resource impacts (e.g. vessel propeller scarring) and with sensitive habitats and wildlife. Compared to Alternatives 3 and 4, this alternative places greater emphasis on allowing public use. Alternative 2 is specifically designed to reduce conflicting and heavy concentrations of use while still allowing a relatively high level of overall use. This alternative would maintain many of the marine zones in the no action alternative and would add 39 new marine zones to provide additional, site-specific protection where resource damage is evident. In addition, these new zones would have the least restrictive regulations needed to meet the resource protection goals set by the advisory council and the FKNMSPA.

This alternative incorporates most of the spatial and regulatory recommendations from the advisory council and its working groups (shallow water wildlife and habitat protection working group and ecosystem protection working groups). For information about those marine zone recommendations that are not included in this or any alternative, see Section 3.7. The shallow water wildlife and habitat protection working group recommendations included in Alternative 2 are those that would allow a greater level of public access and use. Alternatives 3 and 4 include the more protective options than the working group recommended.

Specifically, Alternative 2 would add 31 WMAs, 6 SPAs, and 2 conservation areas compared to the no action alternative. The conservation area is a new proposed zone type that would include what are now the existing ERs and SUAs. Alternative 2 maintains Key Largo and Looe Key as management areas.

Wildlife management areas (Alternative 2)

A total of 59 WMAs are proposed (31 new areas compared to the no action alternative). The modified or proposed new WMAs would provide additional, site-specific protection where resource damage is evident and the least restrictive regulations would be applied to meet the resource protection goals set by the advisory council and the FKNMSPA. Regulations for WMAs are and would continue to be specific to sanctuary resource needs and therefore vary by zone. Proposed regulations would include vessel restrictions on access, anchoring, and speed, and are designed to protect seagrass, hardbottom, and other critical shallow water habitats and associated wildlife including fish, birds, and turtles.

Sanctuary preservation areas (Alternative 2)

A total of 25 SPAs are proposed (six new areas compared to the no action alternative). Differences in regulations from the no action alternative include the addition of idle speed/no wake and no anchor, a three-year phase-out for the issuance of permits for bait fishing (see 3.4.4), and elimination of catch and release by trolling in the four SPAs where it is currently allowed (see 3.4.3) (i.e. Conch Reef, Alligator Reef, Sombrero Reef, and Sand Key SPAs).

Conservation areas (Alternative 2)

(In Alternative 1: No action these are included as ERs and SUAs)

The conservation area is a proposed new zone type. The existing SUA and ER zone names would no longer be used. The proposed regulation for conservation areas is transit-only (without a valid sanctuary permit). This represents no change from the existing regulation applied in ERs and SUAs.

A total of eight conservation areas are proposed (two new areas compared to the no action alternative, which includes two ecological reserves and four special use areas). New habitat types, specifically hardbottom, bank, and seagrass, would be included in Alternative 2.

Management areas (Alternative 2)

(In Alternative 1: No action these zones are referred to as EMAs)

Alternative 2 proposes removing the term “existing management area” and referring to these marine zones by their name (e.g., Looe Key management area, Key Largo management area). There would be no change to the spatial area of Key Largo management area. The Looe Key management area would be decreased to include only the western portion of the existing zoned area. Differences in regulations from the no action alternative include a proposed no anchor regulation in both Key Largo and Looe Key management areas.

Key West National Wildlife Refuge and Great White Heron National Wildlife Refuge would no longer be referred to as EMAs, but would simply be zoned as national wildlife refuges with overlapping and complementary jurisdiction to the sanctuary. In the national wildlife refuges, all regulations in the no action alternative would be maintained with the exception of a small area in Key West National Wildlife Refuge where operation of personal watercraft would be permitted. This proposed regulation change would not affect the refuge boundary (See Section 3.4.1 and Figure 3.2).

3.3.3 Modifications to marine zones within Alternative 3 (preferred alternative)

Alternative 3 places greater emphasis on resource protection over allowing a high level of use. Alternative 3 proposes to maintain many of the marine zones in the no action alternative and would also add marine zones (41 more than Alternative 1, and two more than Alternative 2) to provide additional, targeted site-specific protection where resource damage is evident. Again, as in Alternative 2, this alternative incorporates most of the spatial and regulatory recommendations from the advisory council and its working groups (shallow water wildlife and habitat protection working group and ecosystem protection working group). However, this alternative includes the increased conservation protection measures and more restrictive access recommendations than the no action alternative and Alternative 2. Some of the zones in this alternative were discussed by the advisory council working groups but not included as part of their final recommendations to the advisory council, in particular the Long Key/Tennessee Reef and Tortugas Spawning Corridor SPAs and Western Dry Rocks WMA. ONMS used the information discussed through the working group process and additional input from other NOAA offices, other agencies, and the research community to develop components of this alternative.

Specifically, Alternative 3 would add 32 WMAs (one more than Alternative 2), seven sanctuary preservation areas (one more than Alternative 2), and two conservation areas (the same as Alternative 2) compared to the no action alternative.

Wildlife management areas (Alternative 3, preferred)

A total of 60 wildlife management areas are proposed (32 additional from the no action alternative and 1 more than Alternative 2). In Alternative 3, more protective access restrictions would be applied (e.g., no entry) in many of the proposed modified or new WMAs to meet the resource protection goals set by the

advisory council and the FKNMSPA, and to meet the policies and purposes of the national wildlife refuges. Regulations for WMAs would still vary by zone and would include vessel restrictions on access, anchoring, and speed to protect seagrass, hardbottom, and other critical shallow water habitats and associated wildlife including fish, birds, and turtles.

Sanctuary preservation areas (Alternative 3, preferred)

A total of 26 SPAs are proposed (seven additional compared to the no action alternative and one more than Alternative 2). Differences in regulations from Alternative 2 include three SPA (Carysfort, Sombrero, and Sand Key) that would be limited use areas, accessible by Blue Star Dive Operators only (see Section 3.4.5). All other proposed regulations included in Alternative 2 would apply.

Conservation areas (Alternative 3, preferred)

(In Alternative 1: No action these are included as ERs and SUAs.)

A total of eight conservation areas are proposed (two additional compared to the no action alternative, which includes two ERs and 4 SUAs). There are no differences between Alternative 2 and Alternative 3 for conservation areas.

Management areas (Alternative 3, preferred)

(In Alternative 1: No action these zones are referred to as EMAs.)

Alternative 3 would maintain all the proposed actions as outlined in Alternative 2 for Key Largo and Looe Key management areas.

In the national wildlife refuges, Alternative 3 would maintain the exception of a small area in Key West National Wildlife Refuge where operation of personal watercraft would be permitted (See Section 3.4.1 and Figure 3.2 for details).

3.3.4 Marine zones within Alternative 4

Alternative 4 is primarily designed to protect large contiguous habitats. This alternative strives to meet a balance between protecting site-specific locations where resource damage is evident while also protecting of the largest area of contiguous habitats compared to the other alternatives proposed. To do this, some marine zones are proposed to be combined and larger zones are included in each of the five geographic regions (Upper Keys, Middle Keys, Lower Keys, Marquesas, and Tortugas). This approach aims to more fully meet Goal 2 of the advisory council regulatory and zoning alternatives development workplan: *Protect large, contiguous, diverse, and interconnected habitats that provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life and protect and preserve all habitats and species.* The marine zone specific regulations and access restrictions would be more restrictive in Alternative 4 than in any of the other proposed alternatives. Like Alternatives 2 and 3, this alternative incorporates most of the spatial and regulatory recommendations from the advisory council and its working groups (shallow water wildlife and habitat protection working group and ecosystem protection working group). However, this alternative includes the greatest conservation protection measures and most restrictive access recommendations over all the other three alternatives. Some of the zones in this alternative were discussed by the advisory council working groups but not included as part of their final recommendations to the advisory council, in particular the Long

Key/Tennessee Reef, Tortugas Spawning Corridor, and Western Dry Rocks Conservation Areas, and shoreline to deep reef zone at Carysfort Reef Sanctuary Preservation Area.

Specifically, Alternative 4 would add 31 WMAs (no change from Alternative 2), three SPAs (three less than are included in both Alternatives 2 and 3), seven conservation areas (five more than is included in Alternatives 2 and 3) compared to the No Action alternative.

Wildlife management areas (Alternative 4)

A total of 59 WMAs are proposed (31 additional from the no action alternative, the same as Alternative 2, and one less than Alternative 3). Alternative 4 would include similar access restrictions to those included in Alternative 3. However, in some areas, rather than a 100-yard contour zone around an island, the zone would be squared off for easier marking, enforcement, and compliance.

In addition to specific WMA zone alternatives, Alternative 4 includes an update to an existing sanctuary-wide regulation. The existing operation of vessels regulation at 15 C.F.R. § 922.163(a)(5)(iii)(D), which prohibits operating a vessel at a speed greater than 4 knots or in a manner which creates a wake within 100 yards of residential shorelines, would be modified to require “slow speed” and apply to all shorelines within the sanctuary (for more details see Section 3.2.3).

Sanctuary preservation areas (Alternative 4)

A total of 22 SPAs are proposed (three additional compared to the no action alternative, three less than Alternative 2, and four less than Alternative 3). All proposed regulations included in Alternative 2 would apply and the limited use SPA proposal in Alternative 3 would also apply with the exception of Carysfort SPA. In Alternative 4, Carysfort SPA is proposed to be expanded to extend from the shoreline to the deep reef in an effort to meet the advisory council principle for this management plan review process, that: *Each habitat type should be represented in a non-extractive marine zone in each of the biogeographically distinct subregions of Florida Keys National Marine Sanctuary to achieve replication. The sub regions identified were the Tortugas; Marquesas; and Lower, Middle, and Upper Keys.*

Conservation areas (Alternative 4)

(In Alternative 1: No action these are included as ERs and SUAs)

A total of 13 conservation areas are proposed (seven additional conservation areas compared to the no action alternative and five additional conservation areas compared to Alternatives 2 and 3). Alternative 4 includes the largest number of this zone type in an effort to meet the advisory council principle for this management plan review process, that: *Each habitat type should be represented in a non-extractive marine zone in each of the biogeographically distinct subregions of Florida Keys National Marine Sanctuary to achieve replication. The sub regions identified were the Tortugas; Marquesas; and Lower, Middle, and Upper Keys.*

Several of the zones in this alternative were discussed by the advisory council working groups but not included as part of their final recommendations to the advisory council, in particular the Long Key/Tennessee Reef, Western Dry Rocks, and Tortugas Spawning Corridor conservation areas.

Management areas (Alternative 4)

(In Alternative 1: No Action these zones are referred to as EMAs)

Alternative 4 would maintain all the proposed actions as outlined in Alternative 2 for Key Largo and Looe Key management areas and Key West National Wildlife Refuge where operation of personal watercraft would be permitted (See Section 3.4.1 and Figure 3.2 for details).

3.3.5 Summary of marine zone boundary alternatives

Table 3.3. Marine zones: Summary of wildlife management areas across alternatives

Wildlife management area alternatives	Alternative 1 (status quo)	Alternative 2	Alternative 3 (preferred)	Alternative 4
Total zones	28 ¹	59	60	59
Total within state waters	28	58	57	57
Total area (sq miles)	37.55	67.68	69.62	322.37 ²
Regulations applied	<ul style="list-style-type: none"> • Idle speed/no wake • No motor • No anchor • No access buffer zone • Closed 	<ul style="list-style-type: none"> • Idle speed/no wake • No motor • No anchor • Trolling only • No entry 	<ul style="list-style-type: none"> • Idle speed/no wake • No motor • No anchor • Trolling only • No entry 	<ul style="list-style-type: none"> • Idle speed/no wake • No motor • No anchor • No entry

1. Includes Tortugas Bank no anchor zone.
2. Includes Pulley Ridge no anchor zone.

Table 3.4. Marine zones: Summary of sanctuary preservation areas across alternatives

Sanctuary preservation area alternatives	Alternative 1 (status quo)	Alternative 2	Alternative 3 (preferred)	Alternative 4
Total zones	19 ¹	25	26	22
Total within state waters	7	12	13	10
Total area (sq miles)	18	68.43	78	50.33
Regulations applied	<ul style="list-style-type: none"> • Existing SPA regulations • Baitfishing permits • Catch and release trolling allowed in 4 SPAs 	<ul style="list-style-type: none"> • Existing SPA regulations and: • Eliminate baitfish permits • Eliminate catch and release trolling • Idle speed/no wake • No anchor 	<ul style="list-style-type: none"> • Existing SPA regulations and: • Eliminate baitfish permits • Eliminate catch and release trolling • Idle speed/no wake • No anchor 	<ul style="list-style-type: none"> • Existing SPA regulations and: • Eliminate baitfish permits • Eliminate catch and release trolling • Idle speed/no wake • No anchor

			• Three restricted access SPAs	• Two restricted access SPAs
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1. Includes Western Sambo, as that area is regulated like a SPA.

For more information on proposed updated and/or new regulations related to baitfishing permits, catch and release fishing by trolling, and the proposal for three restricted access SPAs, see Section 3.4.

Table 3.5. Marine zones: Summary of conservation areas across alternatives

Note that “conservation area” is a new zone type that would replace the existing ecological reserve and special use area zone types that are in Alternative 1.

Ecological reserves/special use areas/conservation areas alternatives	Alternative 1 (status quo)	Alternative 2	Alternative 3 (preferred)	Alternative 4
Total zones	6 ¹	8	8	13
Total within state waters	4	6	6	11
Total area (sq miles)	182.23	203.21	203.21	270.01
Regulations applied	Transit only without applicable permit	Transit only without applicable permit	Transit only without applicable permit	Transit only without applicable permit

1. Includes the existing ecological reserves and special use areas.

For more information on proposed updated regulations related to Tortugas Ecological Reserve North access permits, see Section 3.4.

Table 3.6. Marine zones: Summary of management areas and national wildlife refuge across alternatives

Management areas (including national wildlife refuges) ¹ alternatives	Alternative 1 (status quo)	Alternative 2	Alternative 3 (preferred)	Alternative 4
Total zones	4	4	4	4
Total within state waters	2	2	2	2
Total area: Looe Key and Key Largo (sq miles)	139.45	134.75	134.75	134.75

Regulations applied to Key Largo and Looe Key	Prohibited activities: <ul style="list-style-type: none"> • Removing, taking, spearing, or otherwise damaging any coral, marine invertebrate, plant, soil, rock, or other material • Spearfishing 	<ul style="list-style-type: none"> • Existing regulations applied and • No anchoring 	<ul style="list-style-type: none"> • Existing regulations applied and • No anchoring 	<ul style="list-style-type: none"> • Existing regulations applied and • No anchoring
Total area: Key West and Great White Heron NWR	656.06	656.06	656.06	656.06
Regulations applied to NWR portions:	Operating a personal watercraft (PWC), airboat, or water skiing	Small area of relief for PWC operation around the "G13" marker	Small area of relief for PWC operation around the "G13" marker	Small area of relief for PWC operation around the "G13" marker

1. For more information on proposed updated regulations related to operation of personal watercraft in Key West National Wildlife Refuge, see Section 3.4.

3.4 Component 4 – Proposed modifications to marine zone regulations by alternative

In addition to regulations that apply throughout the sanctuary (see Section 3.2), there are proposed new and modified regulations that would apply to additional activities within a small number of marine zones. Table 3.7 summarizes alternatives for regulations that would apply in specific marine zones, and the full descriptions for each alternative are explained below.

For more general access regulations (e.g., idle speed/no wake, no motor, etc.) applicable to specific marine zones see the summary tables in Section 3.3 and Section 3.6. For a full list of existing marine zones and existing regulations, see 15 C.F.R. § 922.164 and 15 C.F.R. part 922, subpart P, Appendix II to VI.

3.4.1 Motorized personal watercraft (proposed update)

Note, this proposed regulatory updates applies in the Key West National Wildlife Refuge Existing Management Area.

Alternative 1: No action (status quo)

Existing FKNMS regulations detailed at 15 C.F.R. § 922.164(b)(2) prohibit operating a personal watercraft, operating an airboat, or water skiing within the marine portions of the Great White Heron and Key West national wildlife refuge management areas (except within Township 66 South, Range 29 East, Sections 5, 11, 12, and 14; Township 66 South, Range 28 East, Section 2; Township 67 South, Range 26 East, Sections 16 and 20, all Tallahassee Meridian).

Alternative 2

NOAA, after coordinating with USFWS, proposes to modify regulations for motorized personal watercraft operation to minimize marine wildlife disturbance, minimize user conflicts between motorized personal watercraft operators and other recreationists, and maintain opportunities for motorized personal watercraft use within FKNMS. Current regulations restrict motorized personal watercraft use from a portion of the sanctuary and Great White Heron and Key West national wildlife refuges and manage motorized personal watercraft use through existing regulations for vessel operation in general.

To reduce user conflict while still ensuring resource protection NOAA is proposing to modify the existing prohibition against operating a personal watercraft in the marine portions of Key West National Wildlife Refuge. The proposed regulation will

create a "notch" in Key West National Wildlife Refuge to allow passage of personal watercraft around marker "G13" but on the inside of marker "G WR5" (See Figure 3.2).

This proposed modification would not change the boundary of Key West National Wildlife Refuge, only the area where this restriction would apply. NOAA considered several other options related to operation of motorized personal watercraft but ultimately eliminated them from further review. See Section 3.7 for more information.



Figure 3.2. Proposed area where PWC operation could occur in Key West National Wildlife Refuge. Image: NOAA

Alternative 3 (preferred)

Alternative 3 is the same as Alternative 2. Alternative 3, is NOAA's preferred alternative.

Alternative 4

Alternative 4 is the same as Alternative 2.

3.4.2 Tortugas North Ecological Reserve access permits (proposed update)

Note, this proposed regulatory update applies in the Tortugas North Ecological Reserve.

Alternative 1: No action (status quo)

Existing FKNMS regulations at 15 C.F.R. § 922.167 require permits to access the Tortugas North ER for any activity other than for passage without interruption through the reserve, for law enforcement purposes, or for purposes of monitoring. The current permit process as detailed at 15 C.F.R. § 922.167 requires permit applicants to request a Tortugas North ER access permit at least 72 hours, but no longer than one month, before the desired effective date of the permit. Current regulations also include a two-week maximum permit duration. In addition to the lead time for requesting a permit, FKNMS regulations at 15 C.F.R. § 922.164 (d)(viii) require access permit holders to notify FKNMS staff at Dry Tortugas National Park before entering and upon leaving the reserve.

Alternative 2

Tortugas North Ecological Reserve remains an important sanctuary marine zone for continued protection, management, and controlled access through issuance of access permits. From 2012 through 2015, FKNMS issued a total of 143 Tortugas North ER access permits with an average of 36 per year. The average time permit holders spent in the ER during that period was seven days and activities conducted while in the ER generally included diving and snorkeling with one or two research missions per year.

Based on 30 years of management and issuance of access permits, NOAA is proposing minor modifications to the regulations for Tortugas North ER access permits. While still requiring access permits, updated regulations would

remove the current timing limitation requiring Tortugas North Ecological Reserve access permits be requested no longer than one month before the permit effective date and remove the requirement to notify FKNMS before entering and upon leaving the reserve.

FKNMS believes the requirement to request a permit no greater than a month in advance is not necessary based on the level and type of activity in the Tortugas North ER. Applicants would still be required to request an access permit at least 72 hours in advance to allow FKNMS staff time to review and process the request. Access permits would still be required for access to the Tortugas North ER and the maximum duration of each permit would remain two weeks. These permits serve a valuable purpose in tracking activity and informing enforcement personnel of the vessels approved for operation within the ER. The provision to notify FKNMS staff before entering and upon leaving the reserve is not deemed necessary given the limited amount of use within the reserve. When making the proposed modifications, the contact information for requesting such access permits would be updated.

Alternative 3 (preferred)

Alternative 3 is the same as Alternative 2. Alternative 3 is NOAA's preferred alternative.

Alternative 4

Alternative 4 is the same as Alternative 2.

3.4.3 Catch and release fishing by trolling in four sanctuary preservation area (proposed update)

Note: this proposed regulatory update applies in sanctuary preservation areas.

Alternative 1: No action (status quo)

Existing FKNMS regulations at 15 C.F.R. § 922.164(d)(1)(iii) prohibit fishing by any means within SPAs, except for catch and release fishing by trolling in the Conch Reef, Alligator Reef, Sombrero Reef, and Sand Key SPAs.

Alternative 2

To address concerns regarding potential threats to sanctuary resources, human safety, and conflict of use, NOAA proposes to modify existing SPA regulations to:

remove the exception for catch and release fishing by trolling in the Conch Reef, Alligator Reef, Sombrero Reef, and Sand Key sanctuary preservation areas.

This existing exception is no longer consistent with the goals and objectives of sanctuary management. This proposed update would serve to fulfill the original intent of the SPA zone type to separate conflicting uses and protect benthic habitats. Through this review process, concerns were raised by advisory council working groups and public comment regarding human safety aspects of allowing any level of conflicting use to occur within SPAs. Updating this regulation would also meet agency direction to simplify and, where possible, make the regulations applicable to activities and access for specific marine zones consistent within each zone type. With this proposed modification, catch and release fishing by trolling would be prohibited in all SPAs and such prohibitions would apply in any new proposed SPA (see Section 3.6).

Alternative 3 (preferred)

Alternative 3 is the same as Alternative 2. Alternative 3 is NOAA's preferred alternative.

Alternative 4

Alternative 4 is the same as Alternative 2.

3.4.4 Baitfish permits (proposed update)

Note: this proposed regulatory update applies in sanctuary preservation areas.

Alternative 1: No action (status quo)

FKNMS regulations currently prohibit fishing within SPAs, with exceptions for catch and release fishing in four SPAs noted above (see 15 C.F.R. § 922.164(d)). However, FKNMS has been issuing permits for limited bait fishing in SPAs since the initial 1997 EIS and management plan. Since that time, permits

have been issued as follows: Castnet permits are issued for and valid in all SPAs and are issued by calendar year. Hair hook permits, which are valid in only Davis, Conch, and Alligator SPAs, are issued for October 15 through April 15 and fishing is allowed only from 5:00 a.m. until 10:00 a.m. daily.

Alternative 2

NOAA is proposing to modify baitfish permitting to:

Eliminate, over a three-year period, the practice of issuing permits that allow capture of baitfish from within the sanctuary preservation areas.

The collection of baitfish in SPAs is no longer consistent with the goals and objectives of sanctuary management. This proposed update would serve to fulfill the original intent of the SPA zone type to separate conflicting uses.

The practice of issuing baitfish permits would be eliminated over a three-year period following the effective date of final regulations. During this time, only individuals who have historically held baitfish permits would be eligible to receive any further permits. Baitfish permit data from 2019 would be used to determine those eligible for permits in the three-year phase out period. In conjunction with this proposed change, the *Office of National Marine Sanctuaries Instructions for Submitting Applications for National Marine Sanctuary Permits and Authorizations, Appendix D Florida Keys National Marine Sanctuary Baitfishing Permits* would be eliminated.

Alternative 3 (preferred)

Alternative 3 is the same as Alternative 2. Alternative 3 is NOAA's preferred alternative.

Alternative 4

Alternative 4 is the same as Alternative 2.

3.4.5 Limited use access restrictions for specific sanctuary preservation areas (proposed new)

Note: this proposed regulatory update applies in select sanctuary preservation areas.

Alternative 1: No action (status quo)

Existing FKNMS regulations do not include specific marine zones that restrict the number of users that can access an area or marine zone at any one time.

Status quo for this action also applies in Alternative 2. No additional information is provided for this alternative as they are the same as Alternative 1: No action, where the sanctuary does not restrict the overall level of use in any marine zone.

Alternative 2

Alternative 2 maintains the existing management approach as described above in Alternative 1: No action.

Alternative 3 (preferred)

NOAA is proposing to limit the levels of use within a select number of SPAs. The areas proposed would be Carysfort, Sombrero, and Sand Key SPAs. These sites include areas within each of the central regions of the Florida Keys: Upper Keys, Middle Keys, and Lower Keys.

This proposal is based on increasing levels of overall use and in some areas, increasing concentrated uses that could impact both the condition of sanctuary resources and the user experience. To address these concerns, NOAA proposes to restrict the overall numbers of users that can access these areas at any one time. In Alternative 3, NOAA proposes to:

restrict user access in Carysfort, Sombrero, and Sand Key sanctuary preservation areas to Blue Star¹ dive/snorkel operators.

In conjunction with this proposed regulation, NOAA would use data from the 2017 FWC Aerial Overflight User Survey, other data sources, and input from the public and user groups to determine if the proposed SPAs are the best sites to test this management approach. NOAA would consider innovative approaches to managing concentrated uses in the sanctuary including limiting access to Blue Star dive/snorkel operators only. (See Section 3.5 Goal 3, Objective 1, Activity 1 for proposed management plan activities related to this action.)

Alternative 4

Alternative 4 includes the same proposed new regulation creating limited-use SPAs as described in Alternative 3; however, this would only apply in Sombrero and Sand Key SPAs. In Alternative 4, FKNMS is proposing to expand the Carysfort Sanctuary Preservation Area from the shoreline to the deep reef (see Section 3.6).

¹ Blue Star is a program established by the sanctuary recognizing tour operators who are committed to promoting responsible and sustainable diving, snorkeling, and fishing practices to reduce the impact of these activities on ecosystems in the Florida Keys. Blue Star operators take the extra step to educate their clients to be better environmental stewards and to interact responsibly with natural resources in the Florida Keys. Visit <https://sanctuaries.noaa.gov/bluestar> for more information.

Table 3.7. Additional marine zone regulations: Summary of alternatives

Notes: The marine zone where each regulation would apply is in bold. Alternative 3 is the preferred alternative.

Sub-action	Alternative 1: No action (status quo)	Alternative 2	Alternative 3 (preferred)	Alternative 4
3.4.1 Motorized personal watercraft	No action: Operating a personal watercraft, operating an airboat, or water skiing are prohibited within the marine portions of the Great White Heron and Key West national wildlife refuge management areas . 15 C.F.R. § 922.164(b)(2)	Create a "notch" in Key West National Wildlife Refuge to allow passage of personal watercraft around marker "G13" but on the inside of marker "G WR5"	Same as Alternative 2	Same as Alternative 2
3.4.2 Tortugas North Ecological Reserve access permits	No action: For access to Tortugas Ecological Reserve North , access permits must be requested at least 72 hours but no longer than one month before the date the permit is desired to be effective. 15 C.F.R. § 922.167(b)(1) and The following activities are prohibited within the ecological reserves: entering or leaving the Tortugas North area with a valid access permit issued pursuant to §922.167 without notifying FKNMS staff at the Dry Tortugas National Park office by telephone or radio no less than 30 minutes and no more than 6 hours before entering and upon leaving the Tortugas Ecological Reserve. 15 C.F.R. § 922.164(d)(1)(viii)	Remove the current requirement for requesting access permits to Tortugas Ecological Reserve North no longer than one month before the date of the permit. Remove the requirement to notify FKNMS before entering and upon leaving Tortugas Ecological Reserve North .	Same as Alternative 2	Same as Alternative 2
3.4.3 Catch and release fishing by trolling in four sanctuary	No action: Allow exception for catch and release fishing by trolling in the Conch Reef, Alligator Reef,	Remove the exception for catch and release fishing by trolling in the Conch Reef, Alligator Reef,	Same as Alternative 2	Same as Alternative 2

preservation areas	Sombrero Reef, and Sand Key Sanctuary preservation areas. 15 C.F.R. § 922.164(d)(1)(iii)	Sombrero Reef, and Sand Key sanctuary preservation areas.		
3.4.4 Bait fishing permits	No action: Castnet permits are issued for and valid in all sanctuary preservation areas where fishing is prohibited (with exceptions noted above for catch and release in certain zones), and are issued by calendar year. Hair hook permits are valid in only Davis, Conch, and Alligator sanctuary preservation areas , where fishing is prohibited (with exceptions noted above), are issued for October 15 through April 15, and only allow fishing from 5:00 a.m. until 10:00 a.m. daily.	Eliminate, over a three-year period, the practice of issuing permits that allow capture of baitfish from within the sanctuary preservation areas.	Same as Alternative 2	Same as Alternative 2
3.4.5 Restricted access in select sanctuary preservation areas	No action: Current regulations do not include specific marine zones that regulate or restrict the number of users that can access an area or marine zone at any one time.	No change from Alternative 1	Restrict user access in Carysfort, Sombrero, and Sand Key sanctuary preservation areas	Restrict user access in Sombrero and Sand Key sanctuary preservation areas

3.5 Component 5 – Proposed modifications to the FKNMS management plan by alternative

Since its designation in 1990, FKNMS has worked to address impacts from human influences on sanctuary resources. This management plan update is designed to improve the abundance and health of sanctuary resources and the condition of associated habitats through updated and adaptive management efforts, regulatory compliance, community involvement, and stewardship.

3.5.1 Alternative 1: No action (*status quo*)

The resulting effects from maintaining the existing management plan are compared with the effects of implementing an updated management plan as outlined in the below alternative (see Chapter 5).

FKNMS released its first management plan in 1997 and augmented it in 2000 with the Tortugas Ecological Reserve supplemental EIS and management plan. A 2007 revised management plan updated the programmatic non-regulatory actions of these two management documents. Together, these management plans guide actions needed to protect the ocean and coastal ecosystems of the Florida Keys while continuing to allow compatible and sustainable human uses. The existing regulations and management plan address key issues through science, education, outreach, stewardship, enforcement, resource threat reduction, restoration, and administration. Such activities include operating and maintaining vessels and aircraft, training staff, conducting research and resource documentation, implementing education and outreach activities, and installing and maintaining permanent moorings or other installations to protect fragile ecosystem or cultural resources.

The text of the associated documents can be accessed at www.floridakeys.noaa.gov on the management plan webpage.

3.5.2 Alternative 2

Alternative 2 includes a draft updated management plan outlined in Section 3.5.5 below.

3.5.3 Alternative 3 (*preferred*)

Alternative 3 includes a draft updated management plan outlined in Section 3.5.5 below.

3.5.4 Alternative 4

Alternative 4 includes a draft updated management plan outlined in Section 3.5.5 below.

3.5.5 Draft management plan (*Alternative 3, preferred*)

The below draft management plan serves as an overarching framework and is representative of the non-regulatory activities the sanctuary will undertake in the next five to 10 years. These proposed management plan updates are intended to streamline and focus sanctuary management actions, and to align with the goals and objectives in the ONMS Strategic Plan (September 2017).

The text in this draft provides the mission, goals, objectives and proposed priority actions. However, the final management plan activities would be informed by public comment and advisory council input and would reflect the current needs at the time the final management plan is completed.

Vision

Florida Keys National Marine Sanctuary is a living laboratory for scientific research to enhance the understanding of the environment and to improve management decisions for optimal resource conservation while allowing for public use and enjoyment. The public will be engaged and involved so they are aware of, care about, and want to protect and restore the sanctuary's resources for current and future generations.

Mission

Florida Keys National Marine Sanctuary identifies, protects, conserves, and enhances the resources, values, and qualities of the sanctuary, while allowing and managing public and private uses that are compatible with the primary goal of resource protection.

GOAL 1: Improve our understanding of sanctuary resources, ecosystem services, and their value to the Florida keys economy.

GOAL 2: Improve the condition of sanctuary resources and, where possible, restore ecosystem structure and function.

GOAL 3: Reduce threats to sanctuary resources and manage human uses and associated impacts.

GOAL 4: Increase awareness and support for FKNMS and its resources.

GOAL 5: Advance and support collaborative and coordinated management.

Goal 1: Improve our understanding of sanctuary resources, ecosystem services, and their value to the Florida Keys economy.

The activities in this section are intended to advance understanding of sanctuary resources and ecosystem services so that the best available science can be used to inform conservation-based management decisions. Efforts to monitor changing conditions and understand ecological and socioeconomic factors provide essential information needed to identify threats, develop strategies to mitigate these threats, and ultimately protect and conserve sanctuary resources.

There is a long history of research and monitoring programs in the Florida Keys and information from these programs has been presented in the 2011 FKNMS Condition Report, the Draft National Coral Reef Monitoring Program Assessment Report, and numerous other publications and reports. There is a need to evaluate and synthesize the findings from these studies, update the findings with new information on recent impacts to sanctuary resources and habitats, and direct future activities toward the key management needs of today. The intent of this goal is to evaluate this body of knowledge to: (1) help inform management decisions, (2) identify gaps in knowledge needed for management, and (3) direct future monitoring and research priorities to further improve understanding of sanctuary resources and ecosystem services to ultimately improve and adapt management of these resources.

Much of the work conducted within this priority area will be driven by the final updated regulations, marine zones, and management plan, as well as key needs and activities identified in the comprehensive science plan (Activity 2). These efforts will be implemented through collaboration and partnerships.

Objective 1: Assess the state of the science/research of sanctuary resources and habitats and direct future research to inform priority resource protection and management needs.

Activity 1: Host a Florida Keys ecosystem science symposium/workshop to compile and share priority monitoring and research findings.

As part of hosting a Florida Keys ecosystem science symposium/workshop:

Activity 1.1: Identify and articulate management needs to ensure the workshop outcomes are relevant and actionable.

Activity 1.2: Compile and evaluate long-term research and monitoring program data sets to identify gaps and additional targeted research and monitoring needs.

Activity 1.3: Compile all known habitat mapping data, identify gaps, and prioritize future mapping effort.

Activity 2: Develop a comprehensive science plan (the last such plan was completed in 2002) with revised research and monitoring needs and approaches to advance understanding of the status and trends of sanctuary resources and habitats, and facilitate evaluation of the effectiveness of the updated regulations, marine zones, and management plan. The plan will incorporate the data and research gaps/needs recognized at the symposium, and identify appropriate responsible parties to fill those gaps/needs (e.g., direct agency [federal/state] or permitted work).

- Use this plan to annually update the ONMS science needs documents to direct external research projects to better inform and advance sanctuary research and management needs.
- Use this plan to inform priority research within the WQPP.

Activity 3: Establish a Sanctuary Advisory Council research advisory committee working group to provide recommendations on priority research needs and application of available science to conservation-based management. (Note this would be distinct from the WQPP Technical Advisory Committee.)

Activity 4: Develop an online data portal where monitoring and research data and outcomes can be compiled, mapped, synthesized, and queried.

- Build on existing databases to create a unified data portal (e.g., Marine Biological Observation Network [MBON], WQPP monitoring, National Coral Reef Ecosystem Monitoring Program).

Activity 5: Prepare a sanctuary condition report (update the 2011 FKNMS Condition Report)

- Integrate data, products, and tools from ongoing ocean observing projects (e.g. MBON, Integrated Ecosystem Assessment) to inform the next sanctuary condition report.

Activity 6: Facilitate the concept and practice of FKNMS as a living classroom and laboratory. The work conducted will be informed by priority management needs.

Objective 2: Enhance our understanding, management, and interpretation of sanctuary historical resources.

Activity 1: Complete a maritime cultural landscape assessment.

Activity 2: Identify significant historical resources for additional research.

Activity 3: Work with partners to advance historical resource characterization using innovative techniques.

Activity 4: Continue historical resource inventory including biological characterization of historical resource sites.

Activity 5: Implement archaeological research permitting standards to enhance protection of historical resources.

Activity 6: Evaluate visitor access/use and impacts to historical resources and identify interventions to reduce resource conflicts and potential damage from improper use while maximizing visitor access.

Activity 7: Establish a new programmatic agreement for the purpose of satisfying NOAA's responsibilities under Section 106 of the National Historic Preservation Act for activities in Florida Keys National Marine Sanctuary. Through publication of this DEIS, NOAA is seeking public comment on the draft programmatic agreement (see Appendix C).

Activity 8: Pursue opportunities to disseminate historical resource information and interpret the sanctuary's maritime heritage through a variety of avenues to reach audiences locally, regionally, and nationally.

Objective 3: Identify and track socioeconomic value and ecosystem services provided by the sanctuary and its resources.

Activity 1: Update the socioeconomic valuation of FKNMS and include a section on historical resources.

Activity 2: Use the updated socioeconomic valuation findings to communicate the value of the sanctuary and its resources to decision-makers and targeted user groups, including diving and fishing operators in the Florida Keys.

Goal 2: Improve the condition of sanctuary resources and, where possible, restore ecosystem structure and function.

The objectives identified below target the parameters assessed in the 2011 FKNMS Condition Report: water quality, habitat, and living marine resources. (Note: historical resources are also included in the condition report; however, activities related to those resources are included in Goal 1). Several specific activities to address each objective are identified below. However, additional actions will be identified through development of a sanctuary research plan (see Goal 1, Objective 1, Activity 2) and through actions in support of Goal 5: Collaborative and coordinated management.

Objective 1: Water quality: Engage more actively with local and regional entities addressing issues related to water quality.

Activity 1: Strengthen engagement with the WQPP and its partners to ensure that long-term water quality, associated habitat monitoring programs, and special studies are supported and maintained and applied to management needs and decisions.

Activity 2: Engage with the South Florida Ecosystem Restoration Task Force to ensure Florida Keys water quality, habitat, living marine resource conditions, and community interests are considered and integrated into regional restoration and management plans. This activity also serves to support Objective 2 and 3 within this goal.

Activity 3: Identify additional water quality parameters that should be investigated (e.g., industrial discharge, metals, pesticides, endocrine disruptors, bacteria) to better understand enabling factors and stressors impacting sanctuary resources and cost-effective strategies to effectively assess these parameters.

Activity 4: Evaluate and recommend changes to the existing water quality monitoring program to inform management needs.

Activity 5: Evaluate and map long-term and recent water quality data sets to identify water quality improvements, hot spots, spatial and temporal gaps in coverage, and new technologies and approaches to streamline/enhance water quality assessments.

Activity 6: Identify practical non-regulatory steps and solutions to improve water quality.

Objective 2: Habitat: Evaluate FKNMS habitat condition, coordinate ongoing monitoring programs, and develop restoration or mitigation plans/activities where needed.

Activity 1: Participate in and facilitate recovery efforts for threatened coral species and their supporting habitat.

- Work with NMFS Office of Protected Resources and other partners to implement actions identified in the Acroporid Recovery Plan and identify options and best practices for other ESA-listed species.
- Engage with partners such as the NOAA Coral Reef Conservation Program and the Coral Restoration Consortium to advance the science and practice of coral reef ecosystem restoration; increase the scale and success of restoration; enhance coordination between researchers, field practitioners, and managers; facilitate and encourage the use of FKNMS as a field laboratory for research, testing of new methodologies, and demonstration projects; and promote scaling up of restoration projects.

Activity 2: Work with research and management partners to advance coral disease intervention research and implement activities at high priority sites to reduce impacts, address enabling conditions, reduce disease spread, enhance the survival of priority corals, and rehabilitate reefs and species damaged by coral disease.

Activity 3: Continue to support efforts led by the Florida Reef Resilience Program (FRRP) to implement a monitoring, research/restoration, and outreach plan for coral condition that addresses coral bleaching, disease, ocean acidification, and other climate-related stressors.

Activity 4: Work with partners to identify and assess factors that affect the vulnerability and resilience of seagrass habitats to chronic and acute impacts and emerging threats and enhance efforts to restore degraded and damaged seagrass habitats. Develop and implement recommendations for restoring degraded and damaged seagrass habitats.

Activity 5: Expand efforts to monitor changes to hardbottom habitats. Evaluate the ecological dynamics, functional significance, and economic importance of these habitats, and the effectiveness of marine zoning in reducing human impacts through partnerships with FWC, The Nature Conservancy, Bonefish Tarpon Trust, and others.

Activity 6: Identify and test new ecological restoration approaches to improve recovery and resilience of ecosystem components with a focus on improving habitat quality and condition; enhancing recruitment and survival of stony corals, sponges, soft corals, anemones, and other benthic invertebrates; rebuilding degraded populations of species; and restoring ecosystem structure and function.

Activity 6.1: Create a restoration permit category to facilitate restoration and associated requirements (e.g., monitoring and reporting) to further sanctuary management goals.

Activity 6.2: Develop a sanctuary restoration plan. The restoration plan would include restoration goals, priority restoration needs, nursery and restoration site selection criteria, species type and associated outplanting strategies, expected research and monitoring outputs, evaluation, and management and access options, including the potential to create temporary restoration zones. This plan will build off of the sanctuary condition report and recommendations from the Sanctuary Advisory Council's coral reef ecosystem restoration working group.

Objective 3: Living marine resources: Improve the condition and diversity of natural biological communities

Activity 1: Identify opportunities to further partner with NMFS, SAFMC, GMFMC, and FWC on coordinated management and innovative research of fish and invertebrate populations within the Florida Keys and FKNMS.

- Explore opportunities for ecosystem-based management approaches.

Activity 2: Continue to work with fishery and research partners to advance understanding of fish aggregation sites, potential connectivity between sites and habitat types, and ecological and habitat features that support ecosystem productivity.

Goal 3: Reduce threats to sanctuary resources and manage human uses and associated impacts.

Objective 1: Identify and monitor patterns of human uses and potential impacts of those uses, including existing and emerging threats.

Activity 1: Evaluate spatial patterns of different types of human uses within different habitats, characterize impacts associated with user groups and effectiveness of existing measures to minimize those impacts, and identify interventions to reduce potential damage to resources and habitats from human uses.

- Summarize findings for public information and decision-making purposes.
- Coordinate with similar efforts underway in the northern portions of the Florida reef tract supported by Florida DEP.

Activity 2: Based on the above evaluation, consider the need to address concentrated uses and potential adverse impacts to sanctuary resources, including the potential to establish limited use areas (See Section 3.4.5 for a proposed limited use area regulation).

Objective 2: Reduce adverse impacts to key marine species and habitats.

Activity 1: Implement rapid emergency response to key threats to reduce immediate pressure and provide time for coordinated, adaptive management strategies to be developed and instituted (e.g., temporary closures to reduce pressures on diseased or stressed corals). (This action is aligned with the proposed regulatory alternatives updating the existing emergency regulation, see Section 3.2 for details.)

Activity 2: Develop or update response plans for priority existing and/or emerging threats.

- Examples include: marine debris, derelict vessels, HAZMAT/pollution releases, invasive species, coral bleaching and disease events, fish kills, etc.
- Explore emergency capacity options (e.g., Federal Emergency Management Agency assistance) to be better prepared to assess and minimize impacts to sanctuary resources and facilitate response activities to new and/or emerging threats.

Activity 3: Evaluate and update Damage Assessment Remediation And Restoration Program (DARRP) including methodologies, equipment, and implementation.

- Complete an analysis of all DARRP projects to determine outcomes, effectiveness, and lessons learned and identify future restoration and monitoring directions.
- Coordinate with state partners to improve enforcement opportunities under applicable federal or state laws (Florida Coral Reef Protection Act).

Activity 4: Assess the scope, scale, and potential impact of live rock aquaculture activities.

- Develop a memorandum of understanding with NMFS and FDACS to ensure permitted live rock aquaculture activities are aligned with sanctuary management goals and do not impact sanctuary resources, including realigning agency responsibilities for permitting this activity in the sanctuary. (This action is associated with proposed regulatory alternatives. See Section 3.2 for details.)

Activity 5: Review and evaluate fishing gear used within the sanctuary and work with partners to develop best management practices to mitigate habitat impacts, bycatch, and other stressors associated with the gear (e.g., optimize design and placement of lobster traps, evaluate recommendations from the Florida Marine Debris Reduction Plan to reduce the number of lost and derelict traps).

Objective 3: Facilitate and manage human use ensuring use is compatible with sanctuary resource protection goals.

Activity 1: Enhance regulatory compliance through partnership opportunities.

- Identify/obtain additional funding for resource related law enforcement.
- Explore and establish additional partnerships to support law enforcement (e.g., USCG, USFWS, DEP enforcement of vessel groundings through the Florida Coral Reef Protection Act, Monroe County).
- Explore the use of technology for enforcement activities (e.g., unmanned aerial systems, vessel monitoring systems).
- In conjunction with law enforcement and the community, develop a “see something, say something” app that facilitates public information sharing on impacts to sanctuary resources and potential illegal activity.

Activity 2: Implement updated marine zoning scheme (as developed and finalized through this current management plan review process).

Activity 3: Update and develop appropriate strategies for a zone-specific monitoring and research program to provide information on the status of marine species and habitats to inform management.

Activity 4: Evaluate effectiveness of and, as needed, update the placement and number of marker, mooring, channel, and information buoys.

- Solicit user and community input to inform mooring buoy evaluation.
- Consider input from the shallow water wildlife and habitat working group, associated marine zone recommendations, and data from the recent Florida Keys Shallow Water Boating Impact Analysis and Trends Assessment to inform this review.
- Using this review, work with the USCG, the state, and Monroe County to identify potential sites for additional aids to navigation (ATONs) and markers in habitats that are heavily impacted by vessel groundings.
- Consider the need and placement of mooring buoys for vessels greater than 65’ length overall. (This action is aligned with the proposed regulatory alternative to prohibiting vessels over 65’ length overall from using small mooring buoys. See Section 3.2 for details.)
- Update the mooring buoy plan based on above evaluation and final regulations and marine zoning scheme developed through this management plan review.
- Mark marine zones and ensure they appear on nautical charts.
- Explore additional technological options, including electronic charts integrated into GPS and smart buoys, for alerting the public to marine zone locations and regulations.

Activity 5: Address the threat of derelict vessels through working with agency and local municipal partners to support ongoing efforts and contribute additional expertise (Florida Marine Debris Reduction

Guidance Plan, Monroe County derelict vessel removal efforts, and pilot vessel turn-in program, among others). (This activity aligns with the proposed regulatory alternatives to prohibit derelict vessels. See Section 3.2 for details.)

Activity 5.1: Work with the towing and salvage industry to develop a suite of guidelines and best practices and apply our current general permit to towing and salvage operations.

Activity 6: Continue interagency collaboration in permitting to avoid and minimize resource impacts.

- Work with towing and salvage operators to ensure they have appropriate sanctuary permits and/or authorization to operate within sanctuary waters. Use best management practices to protect ESA-listed species and designated critical habitat and avoid secondary resource impacts that could occur from towing and salvage operations.
- Work with partner agencies to develop programmatic documents for required consultations to increase efficiency.
- Continue to examine and implement creative approaches for streamlining permit processes while maintaining a high level of resource protection.
- Evaluate cumulative impacts of permitted activities (e.g., fireworks, nearshore construction, research) on sanctuary resources and modify permitting procedures as necessary to reduce those impacts.

Activity 7: Maintain and enhance FKNMS Blue Star programs.

- Continue to support and grow the Blue Star Snorkel/Dive Operator and Blue Star Fishing Guide programs.
- Explore and evaluate program expansion options under the Blue Star umbrella, including offering an online individual certification and/or a business-level certification for non-diving businesses.
- Partner with Blue Star operators to implement and comply with the proposed no anchoring in SPAs regulation and the three proposed limited use SPAs regulation (see sections 3.3 and 3.4 for details).

Activity 8: Evaluate and monitor effects of artificial habitats and use patterns on sanctuary resources.

- Investigate impacts of artificial habitats on fish and invertebrate populations, including the extent to which the spread of invasive species has been facilitated by artificial habitats.
- Monitor and evaluate habitat modification or impacts caused by the installation of artificial habitats.
- Monitor use patterns and socioeconomic effects of artificial habitats.

Goal 4: Increase awareness and support for FKNMS and its resources.

Communication and education underpin all of the other goals and objectives and, as such, will support and be integrated across all of the work FKNMS conducts. Communication and education areas of focus include media, outreach for education, informal education and interpretation, community/constituent engagement, and volunteer coordination as outlined below. Efforts in this arena could be more strategic, coordinated, and focused. To that end the overarching priority is to develop a communication, education, and engagement strategy that will drive more specific priorities within each objective.

Objective 1: Strengthen and enhance strategic communication and outreach.

Activity 1: Develop a communication, education, and engagement strategy.

- Identify targeted tools of communication and education and define how programs should be delivered to achieve higher public awareness, understanding, sustainable use, and appreciation of FKNMS while increasing ocean and climate literacy.
- Collaborate with other reef management entities to support the development of a larger Florida Reef Tract-wide communication and engagement strategy, including crafting and disseminating consistent messaging.

Activity 2: Continue to engage with organizations and constituencies that have historically been FKNMS target audience/partners. Identify gaps in current audience focus and engage additional constituencies, including industry partners, to achieve objectives and support activities outlined in this draft management plan.

Activity 3: Adapt programs and products to reach evolving demographics and diverse user groups.

- Identify priority products for Spanish language translation.

Activity 4: Develop an evaluation toolkit and implement evaluation to determine effectiveness of communication and education programs.

Objective 2: Implement communication and education programming to achieve higher public awareness, understanding, sustainable use, and appreciation of FKNMS.

Activities under this objective will be informed by the completed communication, education, and engagement strategy. However, this objective could include some of the following:

- Develop targeted messaging and education and/or outreach programs for specific constituencies and audiences.
- Expand social media presence and use additional under-utilized communication avenues.
- Update and expand the website and make it mobile friendly.
- Explore the use of and, where needed, create apps or other innovative technology to share information with constituents and provide opportunity for users to share information with FKNMS (e.g., dangers to navigation, regulations, enforcement issues). This could include supporting existing apps and technologies that are hosted by partner agencies and/or organizations.
- Enhance and maintain existing partnerships with businesses and other entities that display sanctuary-related exhibits and/or information.

Specific topics could include:

- Translate water quality goals and WQPP monitoring results and South Florida Ecosystem Restoration Task Force activities into education and outreach materials and programs to influence behavior changes that protect water quality and identify specific actions for engagement.
- Translate habitat monitoring results into education and outreach materials and programs such as using the recent Florida Keys Shallow Water Boating Impact Analysis and Trends Assessment to raise public awareness of boater impacts to seagrass and hardbottom habitats.

- Translate living marine resource monitoring results into education and outreach materials and programs, such as website information on connectivity across habitats and among species.
- Translate historical resources research information into education and outreach materials and programs to convey importance and enhance appreciation and stewardship of historical resources in FKNMS.
- Develop educational and outreach programs and tools that enhance climate and ocean literacy and promote stewardship of FKNMS.

Objective 3: Maintain and enhance community-based and partner engagement to improve collaborative and coordinated management in order to achieve the sanctuary's vision.

Activity 1: Continue support for the Sanctuary Advisory Council.

- Continue to support at most six advisory council meetings per year with additional working group meetings and workshops as needed.
- Work with the Sanctuary Advisory Council chair and vice chair to develop an annual work plan that aligns with and supports the FKNMS management plan and ONMS strategic plan.

Activity 2: Enhance the volunteer program.

- Continue to engage and train volunteers in programming such as Eco-Discovery Center interpreters and Team OCEAN. Recruit volunteers to support existing operations and programs while developing additional opportunities for involvement to achieve the objectives and support the activities outlined in this management plan.
- Explore and support college-level internships in partnership with local academic institutions.

Activity 3: Strengthen existing and explore new partnership opportunities.

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

Activity 4: Work with partners to engage the community in citizen science programs that involve sanctuary resource monitoring and that build on existing efforts including REEF lionfish derbies, Mote Marine Laboratories' Bleachwatch and C-OCEAN, Florida Keys Water Watch, and NOAA volunteer diving program, among others.

Goal 5: Advance and support collaborative and coordinated management.

Florida Keys National Marine Sanctuary is managed in a partnership between NOAA, the state of Florida, and USFWS, and with the support of the Florida Keys community. Partnership has and continues to be at the core of how the sanctuary conducts its operations and programs. Partnership becomes ever more essential given shifting environmental conditions and threats, enhanced research interest and effort, and increased user activity across all sectors, which is coupled with increased agency roles and responsibilities and shifts in available fiscal and human capital resources. A focus on strengthened and enhanced engagement with partners will be integrated in all aspects of operations as FKNMS strives to most efficiently and effectively implement its updated management plan, regulations, and marine zoning scheme. International collaboration is also important, given the ecological connectivity within the Gulf of Mexico and Caribbean.

Objective 1: Improve operational capabilities, efficiency, and effectiveness.

Activity 1: Evaluate current staff and staffing assignments and restructure as needed to best address updated management plan activities.

- Fill priority staff vacancies. Assess potential staffing gaps and determine if and how those can be filled by existing staff and/or potential new hires.
- Analyze current FKNMS staffing structure and restructure as needed for more collaborative, efficient, and effective operations.
- Effectively use the sanctuaries blended workforce (federal staff, state staff through Florida International University, National Marine Sanctuary Foundation staff, and contract staff) to best fulfill the mission and operations.

Activity 2: Build internal capacity through training and professional development.

- Assess and prioritize employee training and develop individual development plans including cross training to create versatility and collaboration across teams.
- Develop and maintain staff capacity and training to conduct emergency response activities.

Activity 3: Review and streamline business and administrative operations.

Objective 2: Continue to maintain and acquire as necessary the infrastructure required to accomplish the mission and goals specified in the FKNMS management plan.

Activity 1: Maintain current facilities, infrastructure (including those currently owned and on loan), and vehicles.

- Assess vessel lifecycle plan and execute, updating on an annual basis.

Activity 2: Assess the need for updated facilities and infrastructure including potential partnership with other state and federal entities.

- Evaluate Key Largo facilities to meet operational and education/visitor use needs.
- Evaluate and implement updates to the Eco-Discovery Center.

Objective 3: Annually develop operating plans that articulate how FKNMS resources would be distributed to meet the site's goals and objectives, and conduct ongoing evaluations of the effectiveness of annual operating plans toward meeting management plan objectives.

Activity 1: Formulate an annual operating plan to meet the objectives of the FKNMS management plan and annual budget allocation.

Activity 2: Evaluate annual operating plan effectiveness toward meeting program objectives. Seek appropriate participation of FKNMS advisory council.

Objective 4: Maintain and strengthen cooperative management with our state, federal, and local partners to advance shared resource management priorities.

Activity 1: Develop a cooperative management annual operating plan and/or framework that facilitates:

- Information and resource sharing to address priority research and threat reduction efforts (e.g., ongoing coral disease event, marine zone habitat, and living marine resources);
- Strategic efforts of the WQPP (work with DEP and EPA);
- Enhancement of enforcement presence for sanctuary regulations (work with FWC, NMFS, USCG, USFWS, and the National Park System [NPS]);
- Coordination among other regional marine and natural resource management entities (e.g., National Park Service, State Parks and Aquatic Preserves, South Water Management District); and
- Opportunities to further partner with NMFS, SAFMC, GMFMC, and FWC on coordinated and innovative research and management of fish and invertebrate populations within the Florida Keys and FKNMS.

Activity 2: Work with Florida DHR to ensure compliance with archaeological research permitting activities.

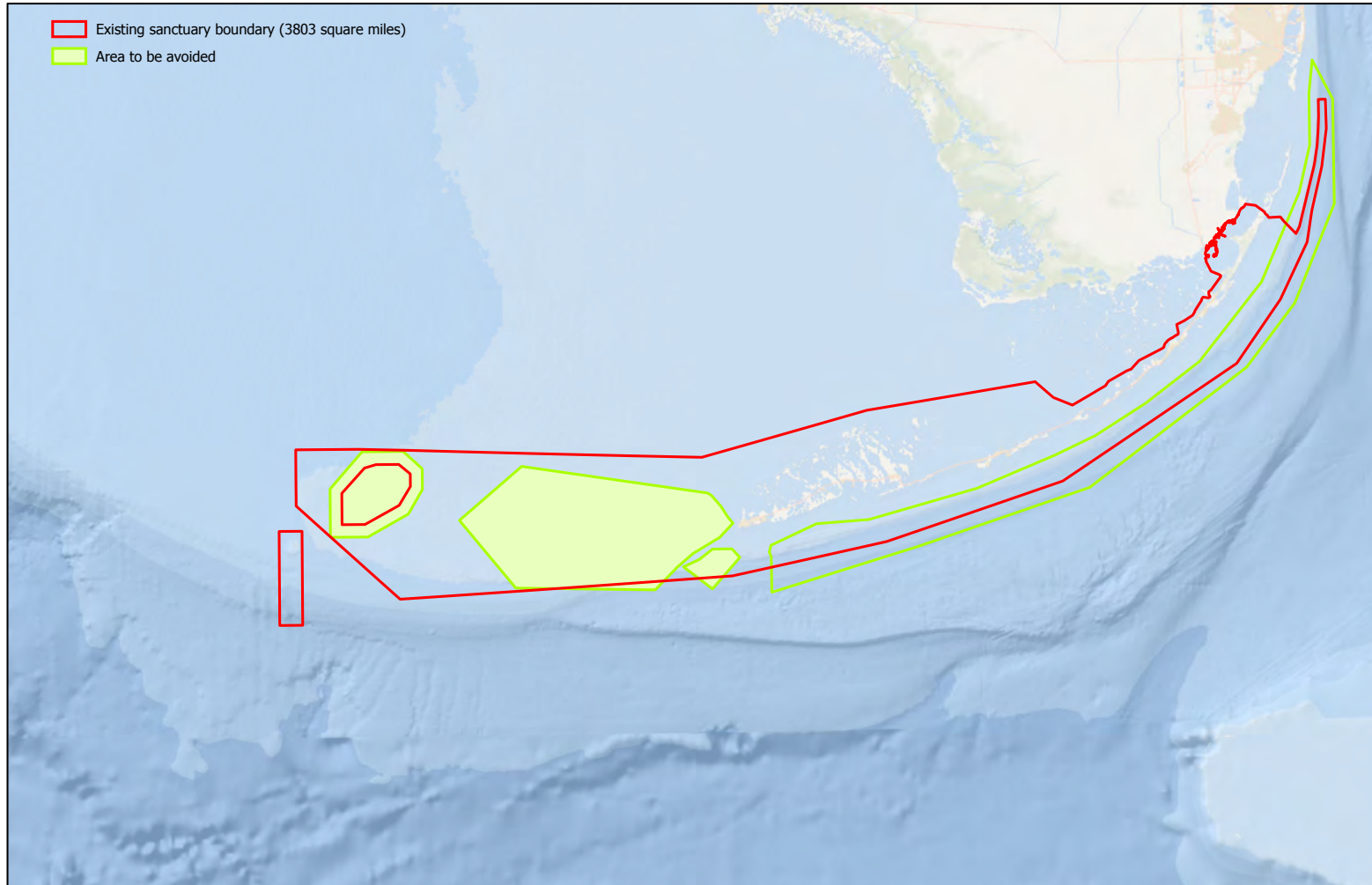
Activity 3: Strengthen partnerships and coordination with Monroe County and municipalities.

3.6 Boundary and marine zone alternative maps

3.6.1 *Boundary alternatives*



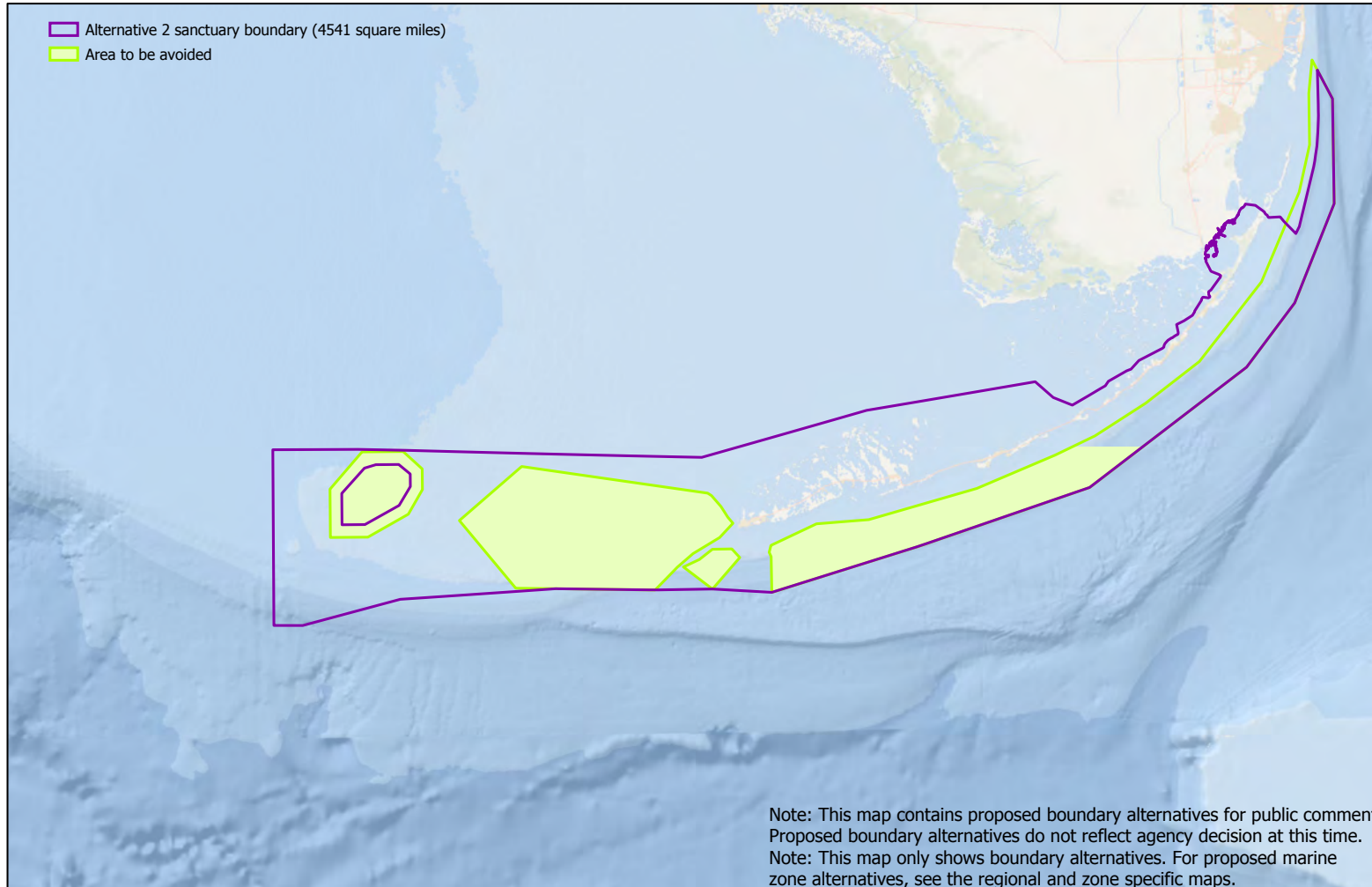
A satellite takes an image of Florida and the Florida Keys from space. Photo: NASA



Florida Keys National Marine Sanctuary: Boundary Alternative 1 (status quo)

0 15 30 60 Miles

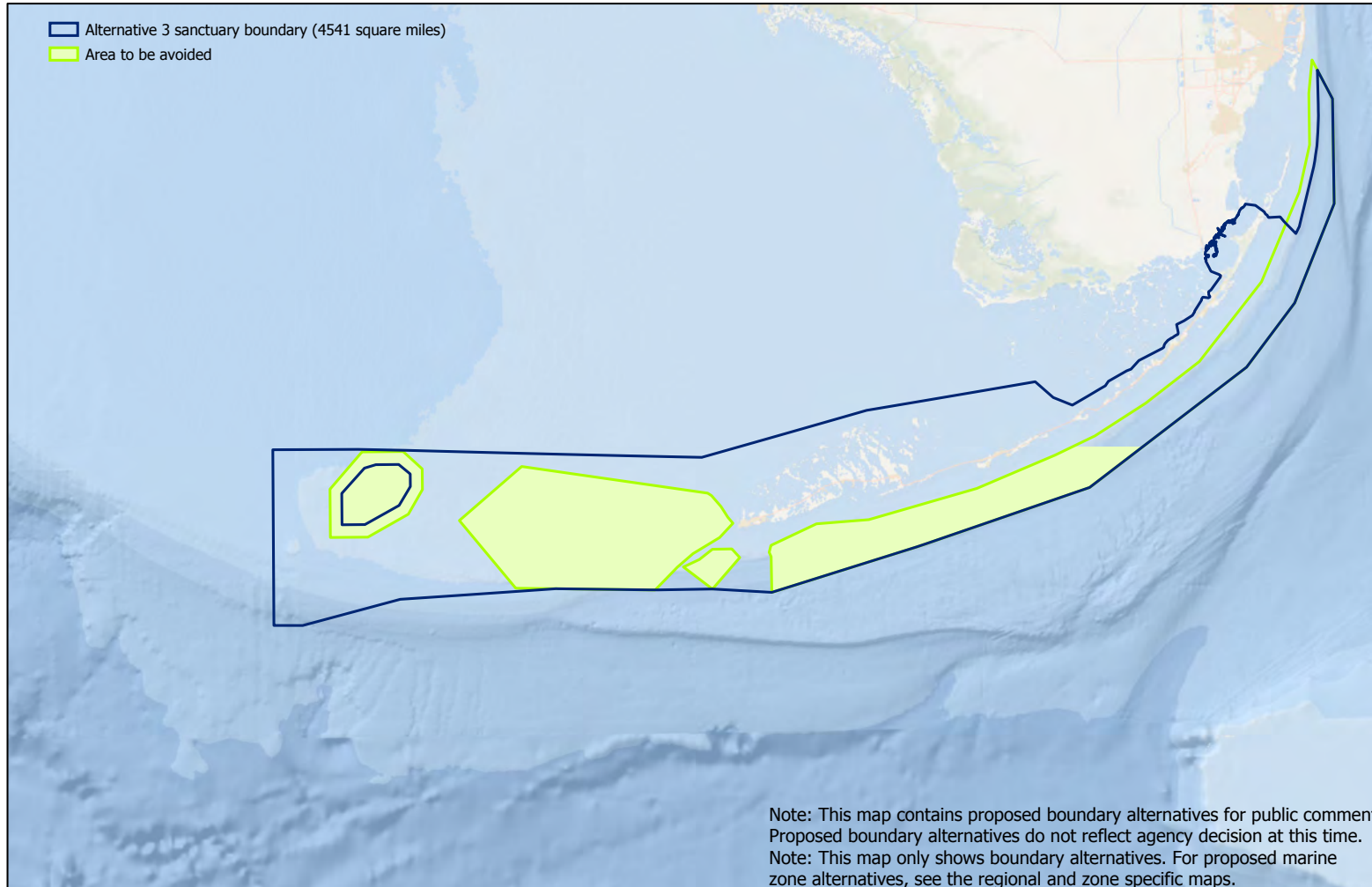




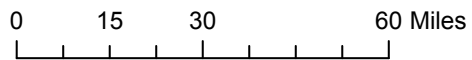
Florida Keys National Marine Sanctuary: Boundary Alternative 2

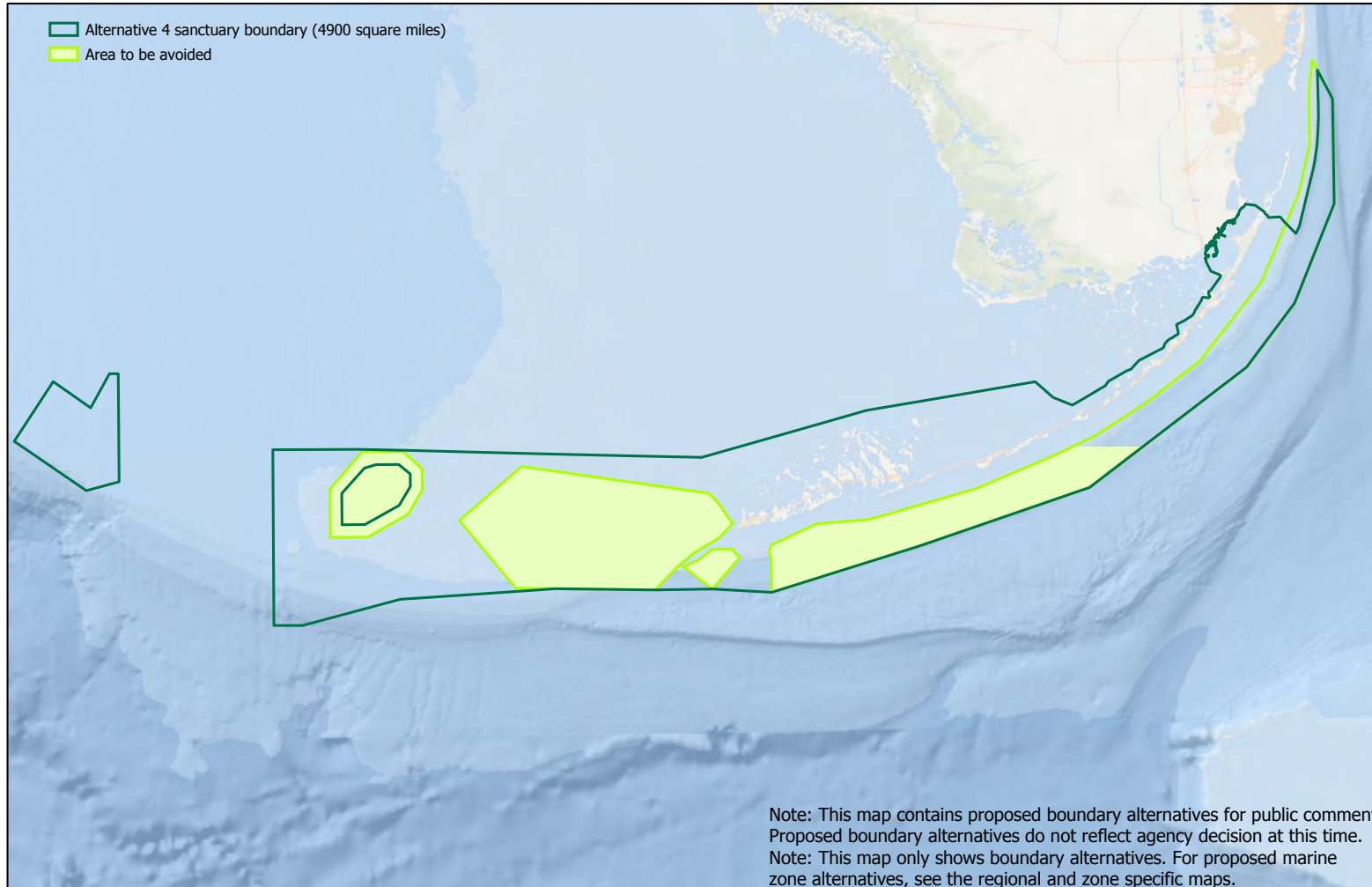
0 15 30 60 Miles





Florida Keys National Marine Sanctuary: Boundary Alternative 3 (preferred)

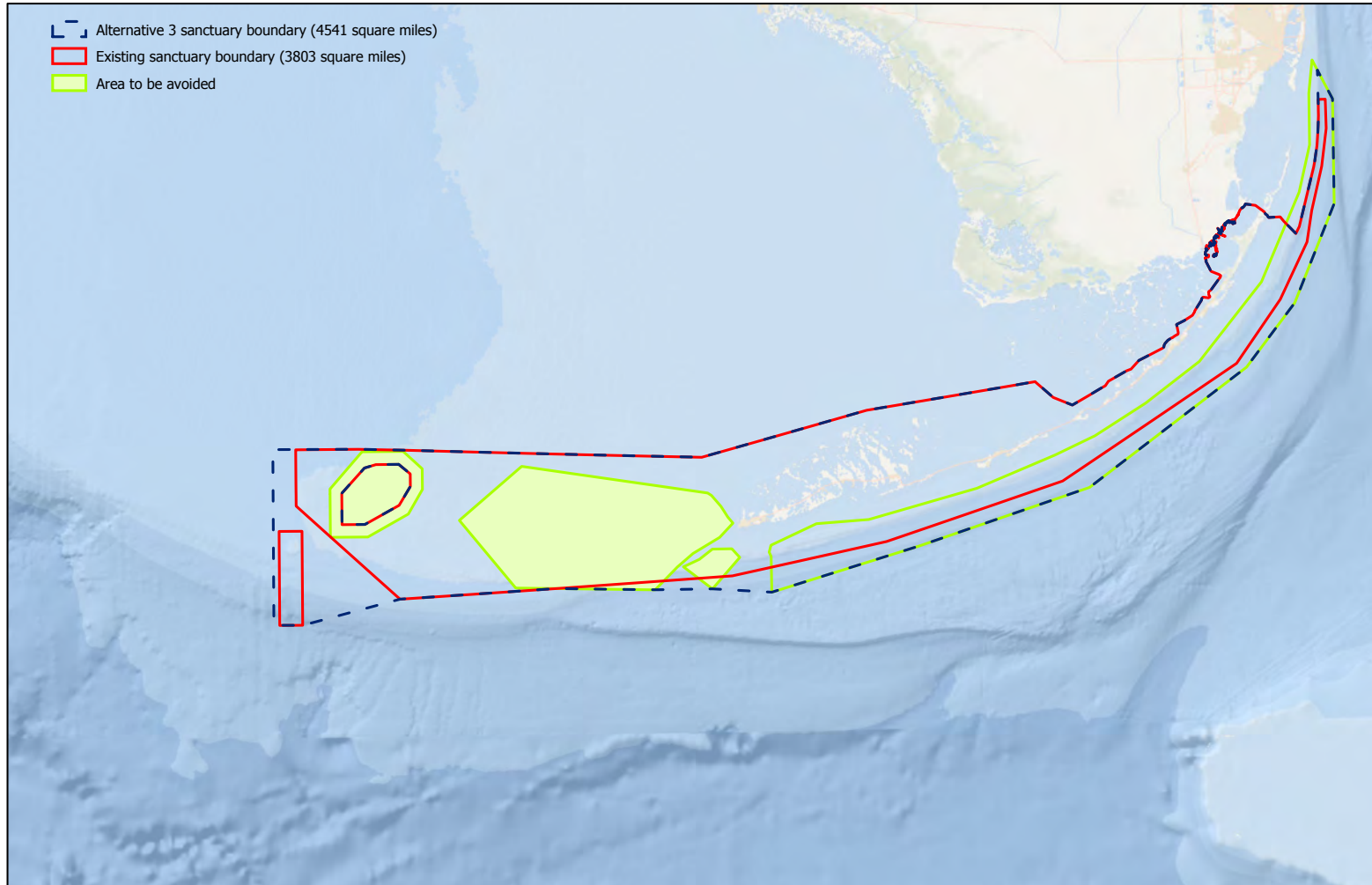




Florida Keys National Marine Sanctuary: Boundary Alternative 4

0 15 30 60 Miles





**Florida Keys National Marine Sanctuary: Boundary Alternative 3 (preferred)
Compared to Alternative 1 (status quo)**

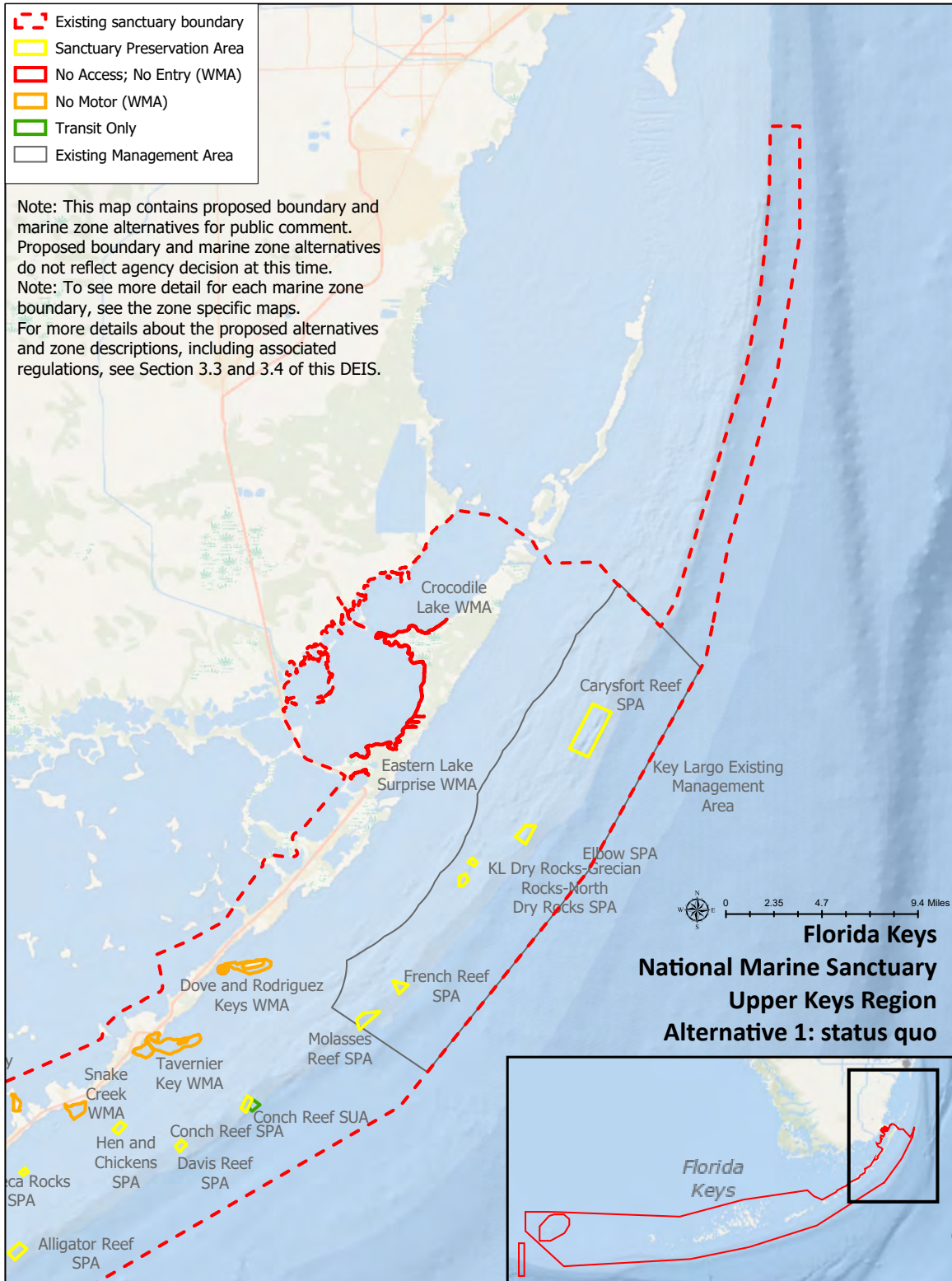
0 15 30 60 Miles

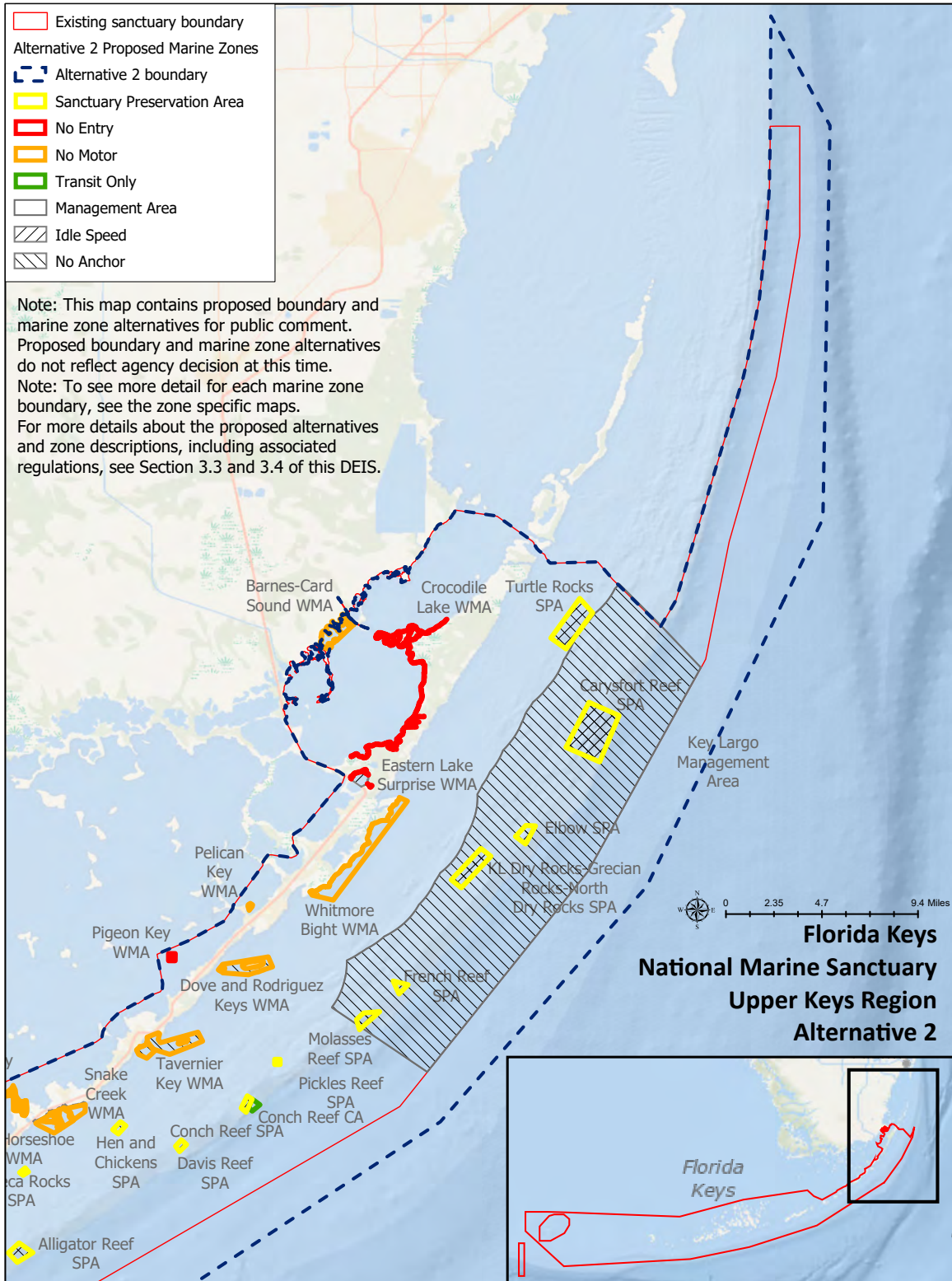


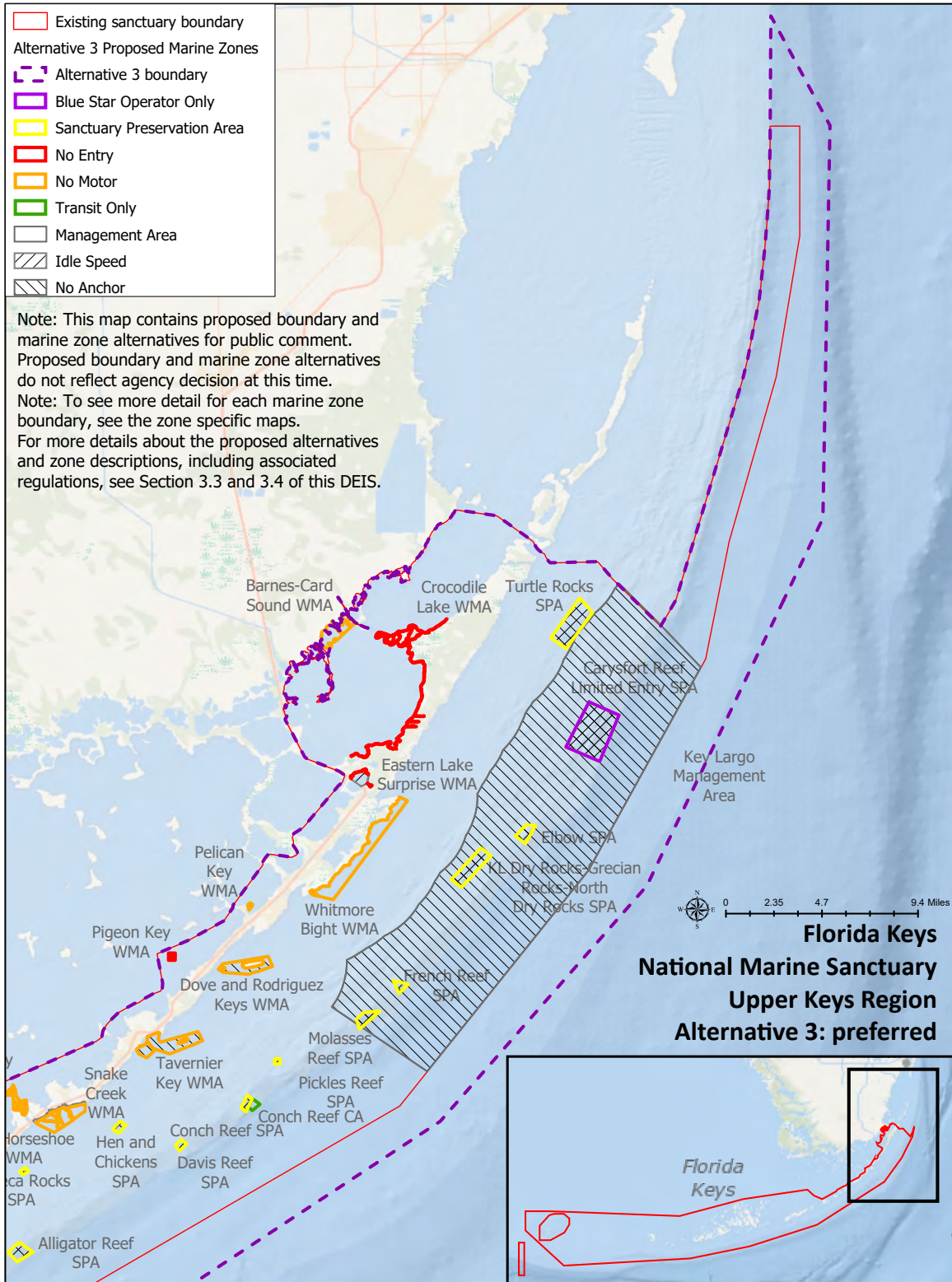
3.6.2 Upper Keys Region and Upper Keys marine zone alternatives

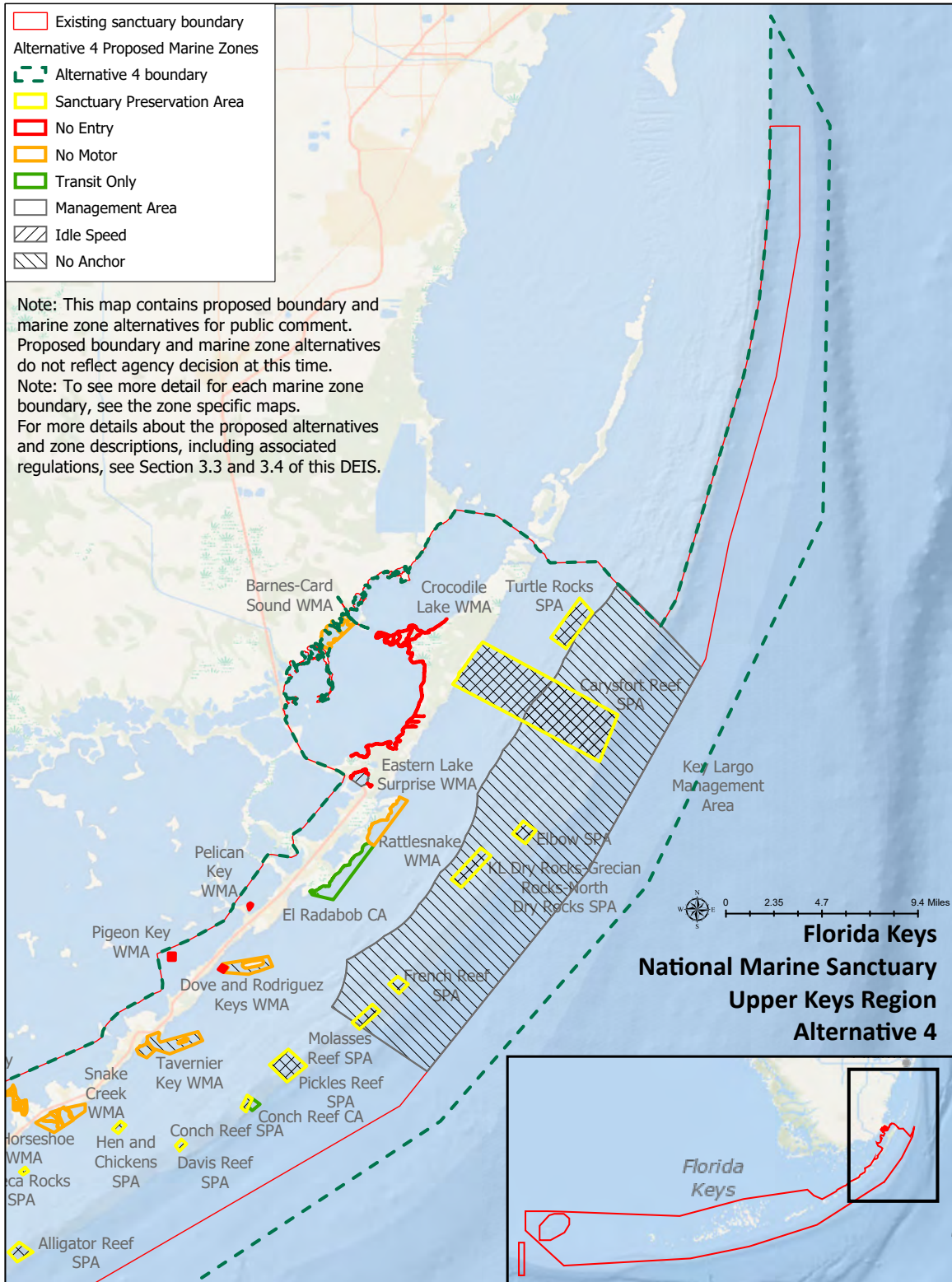


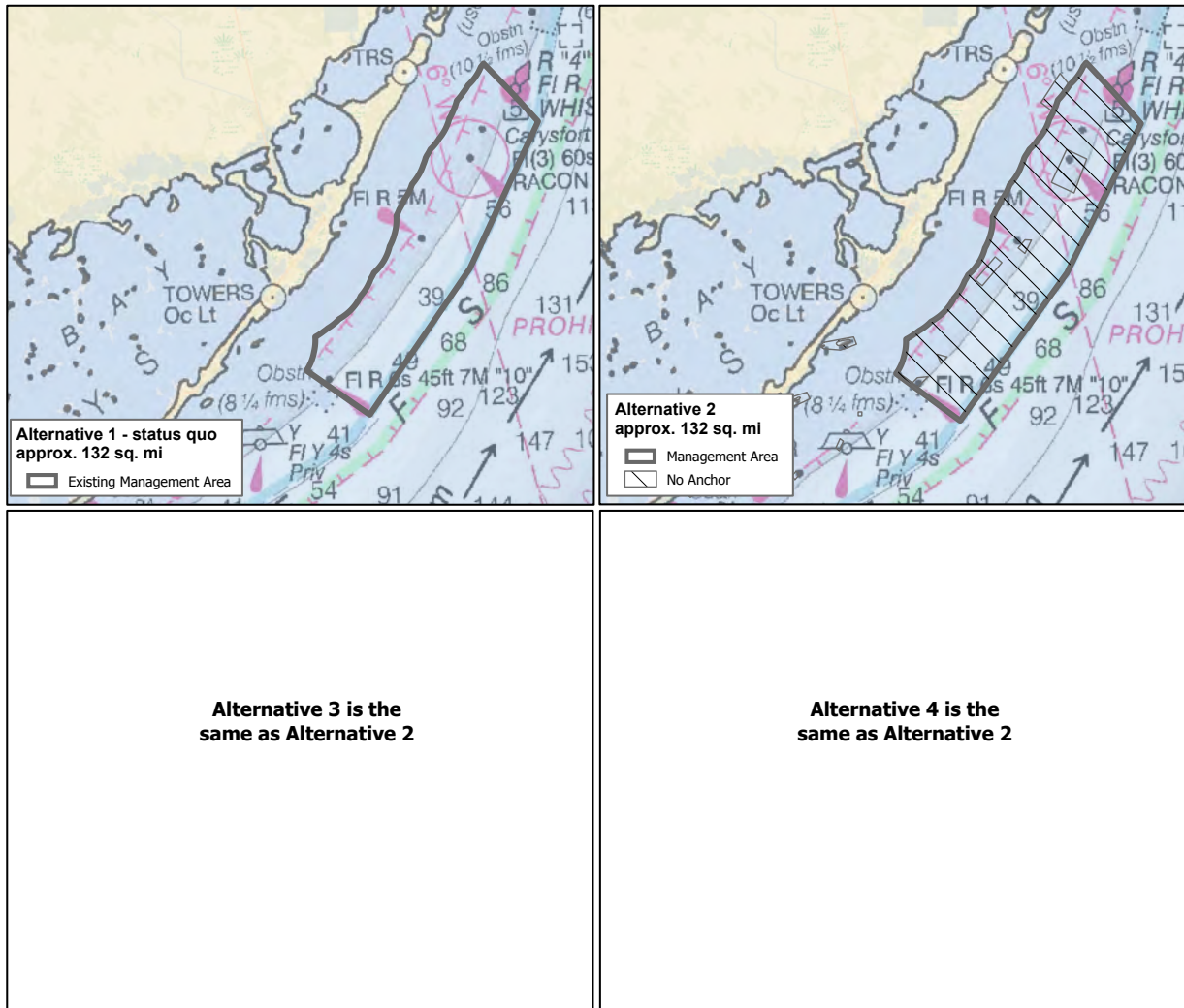
The historic Carysfort Reef Lighthouse sits at the north end of the Key Largo Existing Management Area. Photo: Amy Massey/NOAA







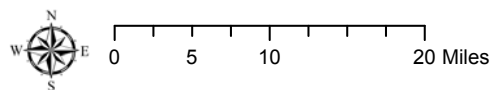




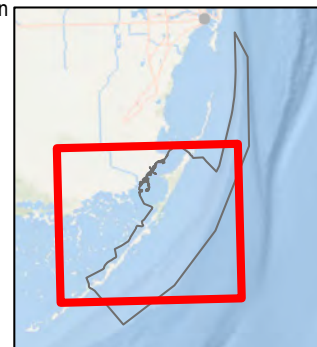
Key Largo Existing Management Area/ Key Largo Management Area

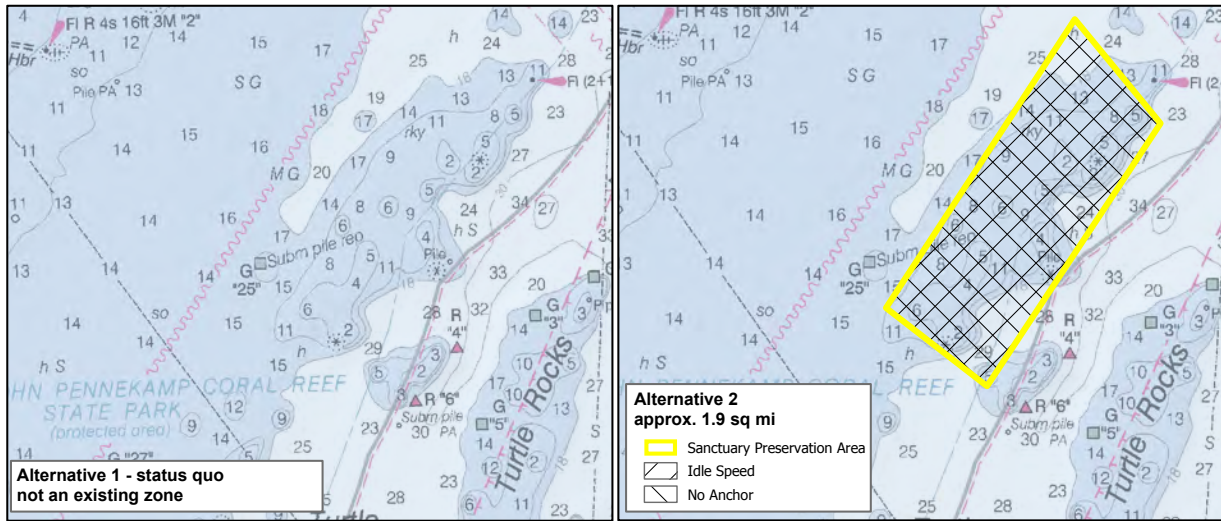
Designated in 1975 as a national marine sanctuary, this zone encompasses an interconnected network of habitat types such as seagrass beds, shallow hardbottom, and coral reefs, contains 6 sanctuary preservation areas, and is located adjacent to other protected areas such as John Pennkamp Coral Reef State Park, Dagny Johnson Key Largo Hammock Botanical State Park, Biscayne National Park, and Crocodile Lake National Wildlife Refuge. This zone includes areas that prohibit spearfishing, marine life collecting, harvest of lobster, and recreational and commercial fishing.

This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.



Upper Keys Region

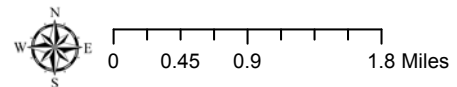




Alternative 3 is the same as Alternative 2

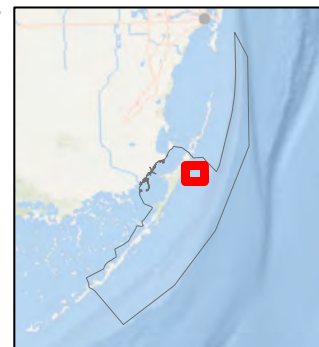
Alternative 4 is the same as Alternative 2

Turtle Rocks Sanctuary Preservation Area

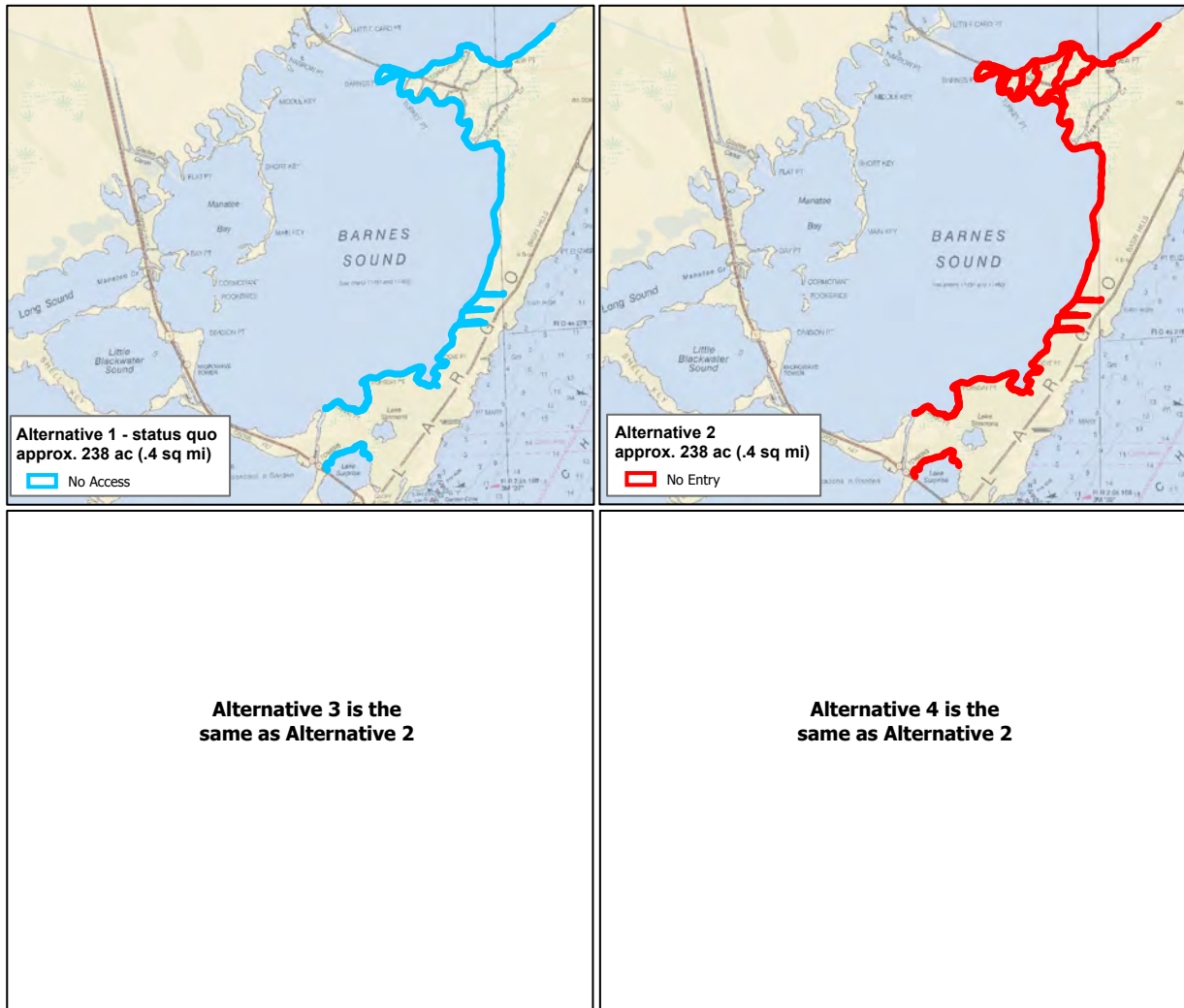


Protects important nearshore, interconnected habitats within the Upper Keys including individual and aggregated patch reefs, seagrass beds, and shallow hardbottom communities. High relief coral reef habitats in this area historically contained large populations of ESA-listed staghorn, elkhorn, and star corals. Currently contains remnant ESA-listed staghorn coral populations and one of the only known fused staghorn colonies. This area is an existing Pennekamp Coral Formation Zone, which prohibits harvest of spiny lobster and deployment of traps.

Upper Keys Region

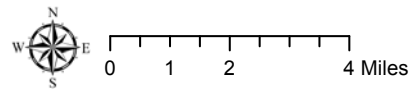


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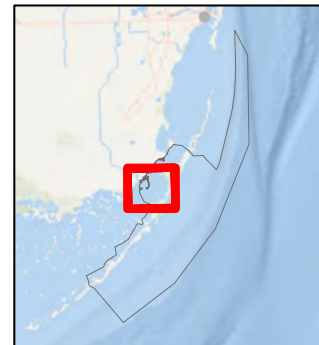


Crocodile Lake Wildlife Management Area

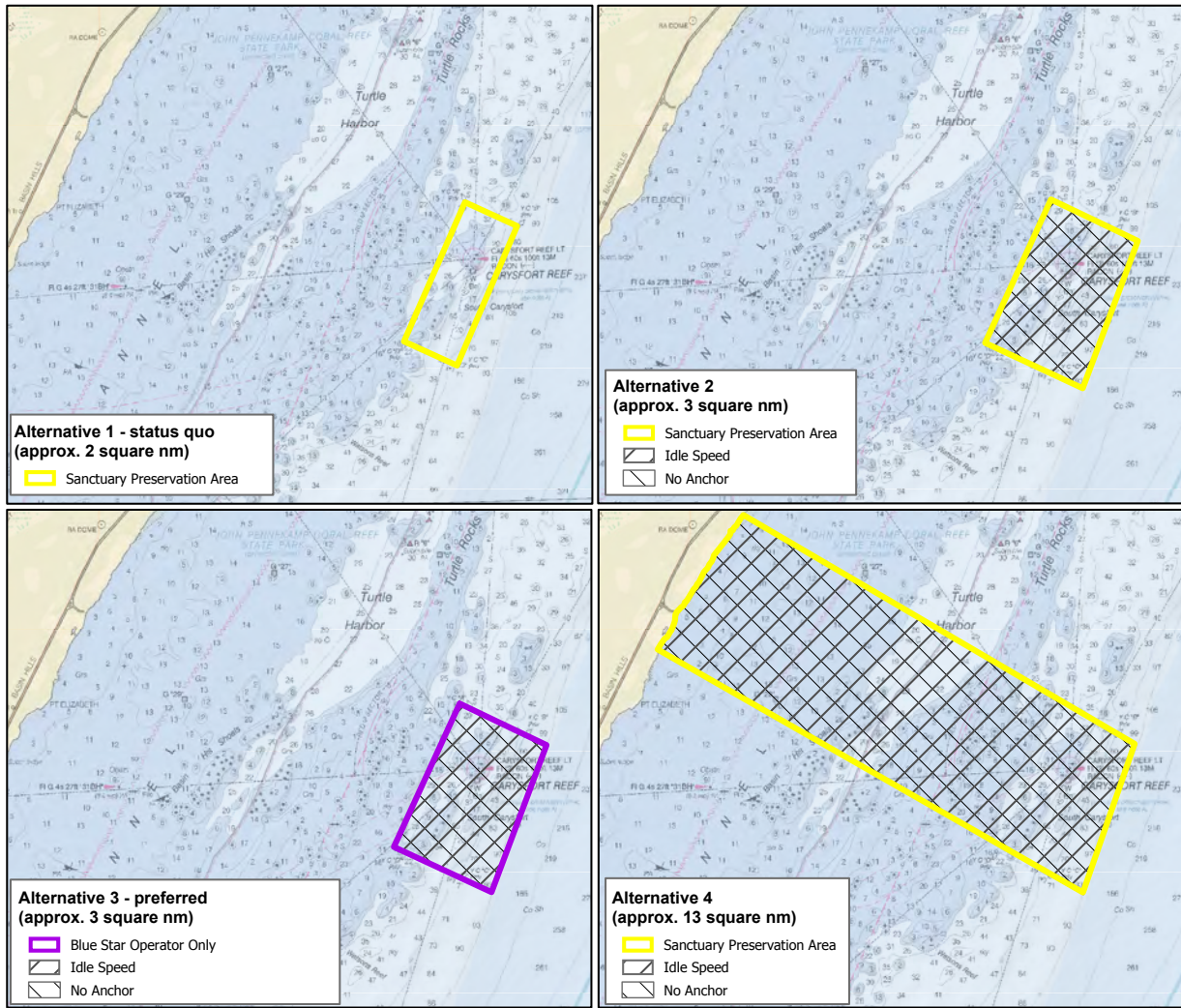
Decreases disturbance of ESA-listed species including American crocodile and West Indian manatee. Decreases disturbance to wading birds using the shallow seagrass flat areas for foraging, nesting, and roosting. Protects the shallow seagrass flats near Card Sound Bridge that have been impacted by vessel groundings and exhibits light to severe prop scarring.



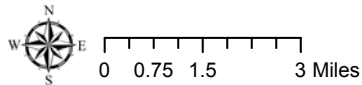
Upper Keys Region



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Carysfort Reef Sanctuary Preservation Area



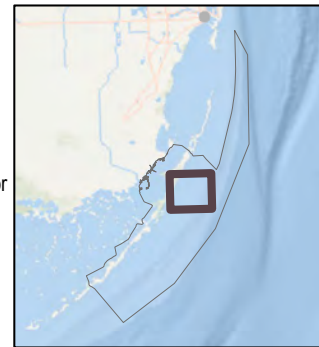
Protects the best developed spur-and-groove reef system in the Upper Florida Keys that formerly supported extensive thickets of ESA-listed elkhorn and staghorn corals and also hosted extensive and diverse deepwater reef habitats. Currently is the largest demonstration site for the restoration of ESA-listed elkhorn and staghorn coral in the Florida Keys. An important candidate site for resilience because of its close proximity to the Florida Current and its interconnectedness to the wider Caribbean. Expanded seaward to include a historic fish spawning aggregation site. The historic Carysfort Lighthouse is included in this SPA. This zone was originally designed to limit consumptive activities and separate users engaged in different activities.

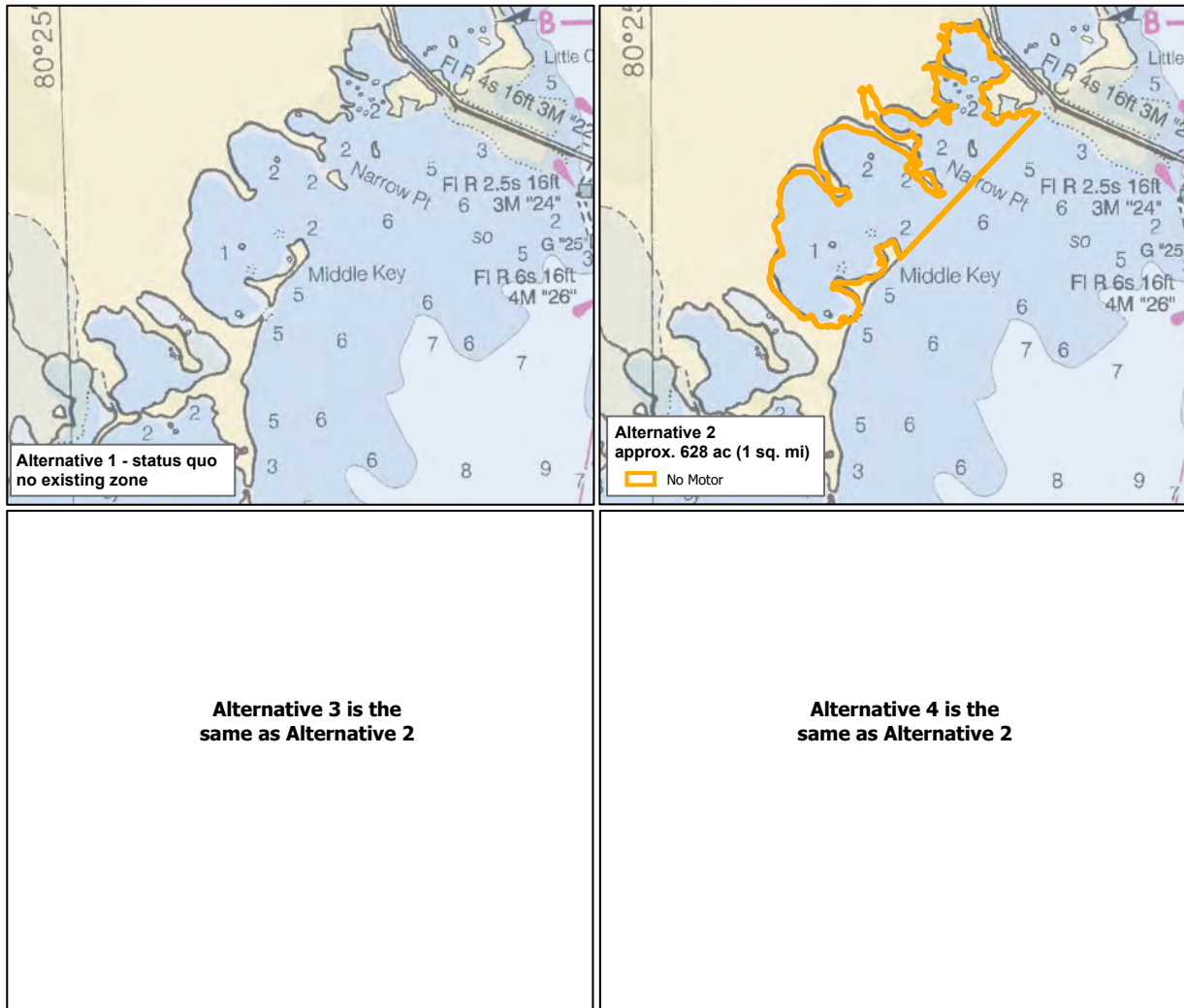
In Alternative 4, extended to the shoreline to protect large, contiguous interconnected seagrass, shallow hardbottom, aggregate patch reef, and deep, drowned spur-and-groove reef habitats, and provides a corridor for migration of different life stages of fishes. This area is proposed to meet the Advisory Council goal to protect large, contiguous, diverse, and interconnected habitats, including for fish moving inshore to offshore through their life cycle.

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For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

Upper Keys Region

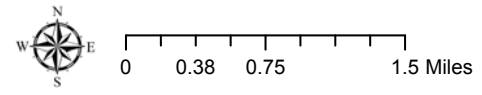
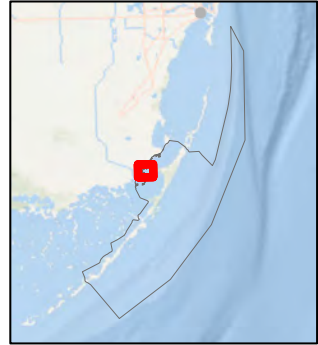




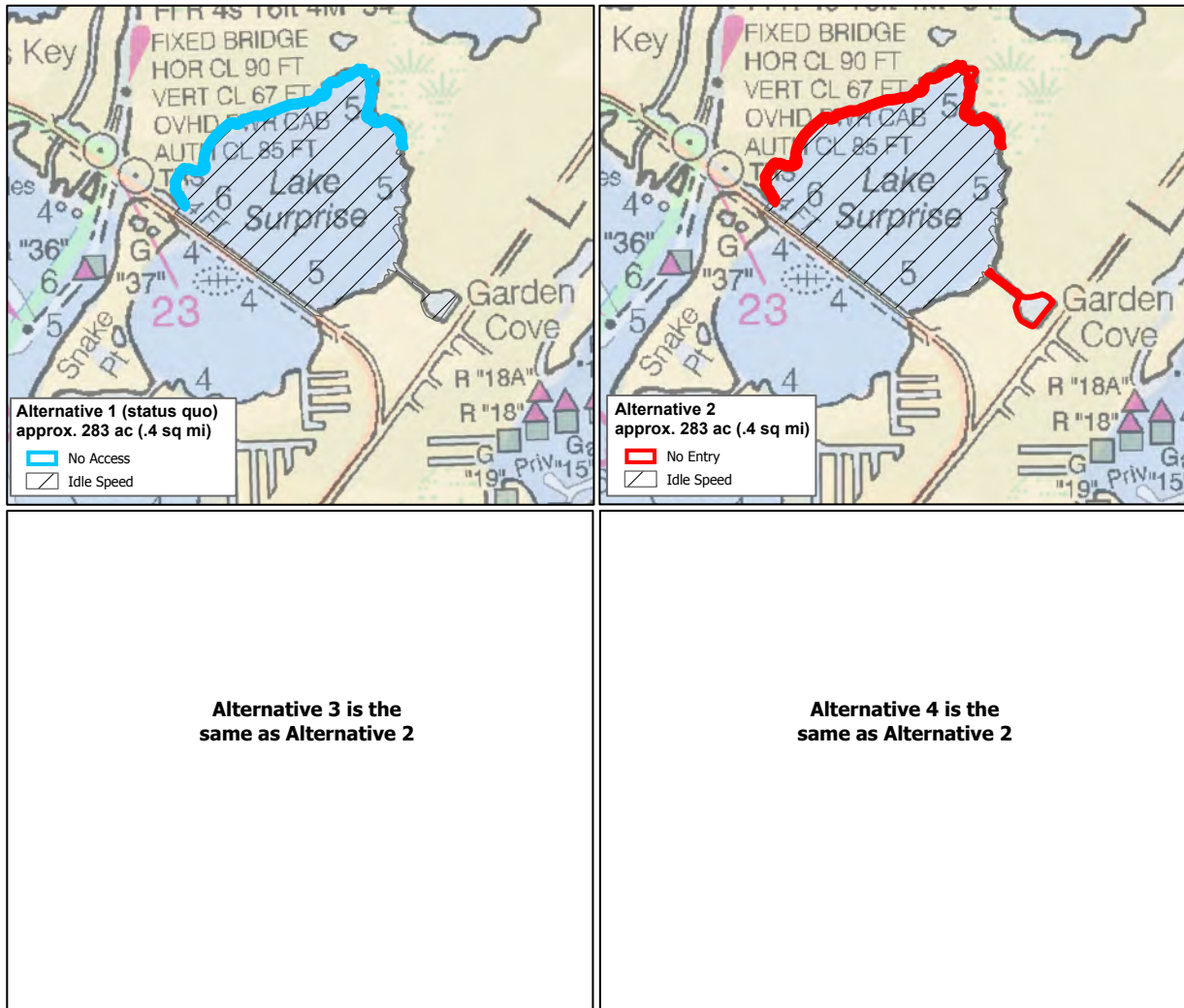
**Barnes Card Sound
Wildlife Management Area**

Decreases disturbance to nesting and wading birds and shallow water gamefish. Decreases impacts to the benthic community including seagrass and macroalgae. A seagrass and macroalgae monitoring program has existed in this area for more than 17 years. Shallow seagrass flats exhibit light to major prop scarring.

Upper Keys Region

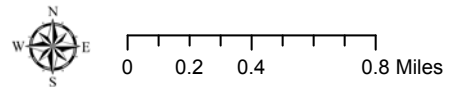


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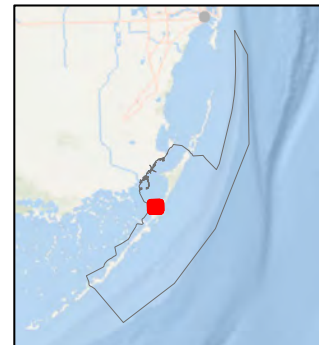


Eastern Lake Surprise Wildlife Management Area

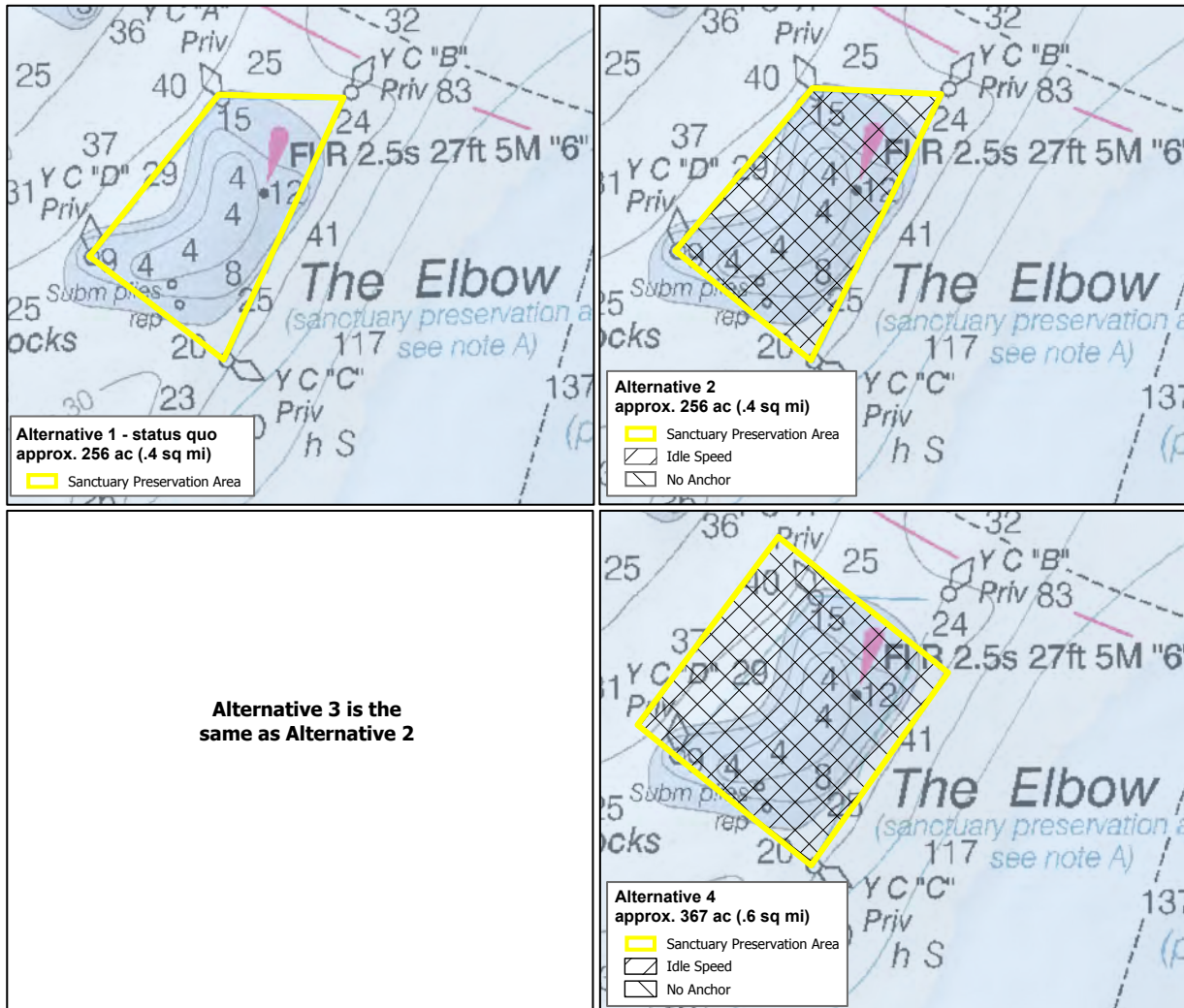
Decreases disturbance of ESA-listed species including American crocodile and West Indian manatee.



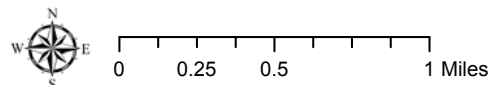
Upper Keys Region



This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

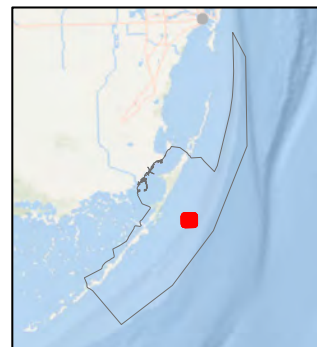


The Elbow Sanctuary Preservation Area

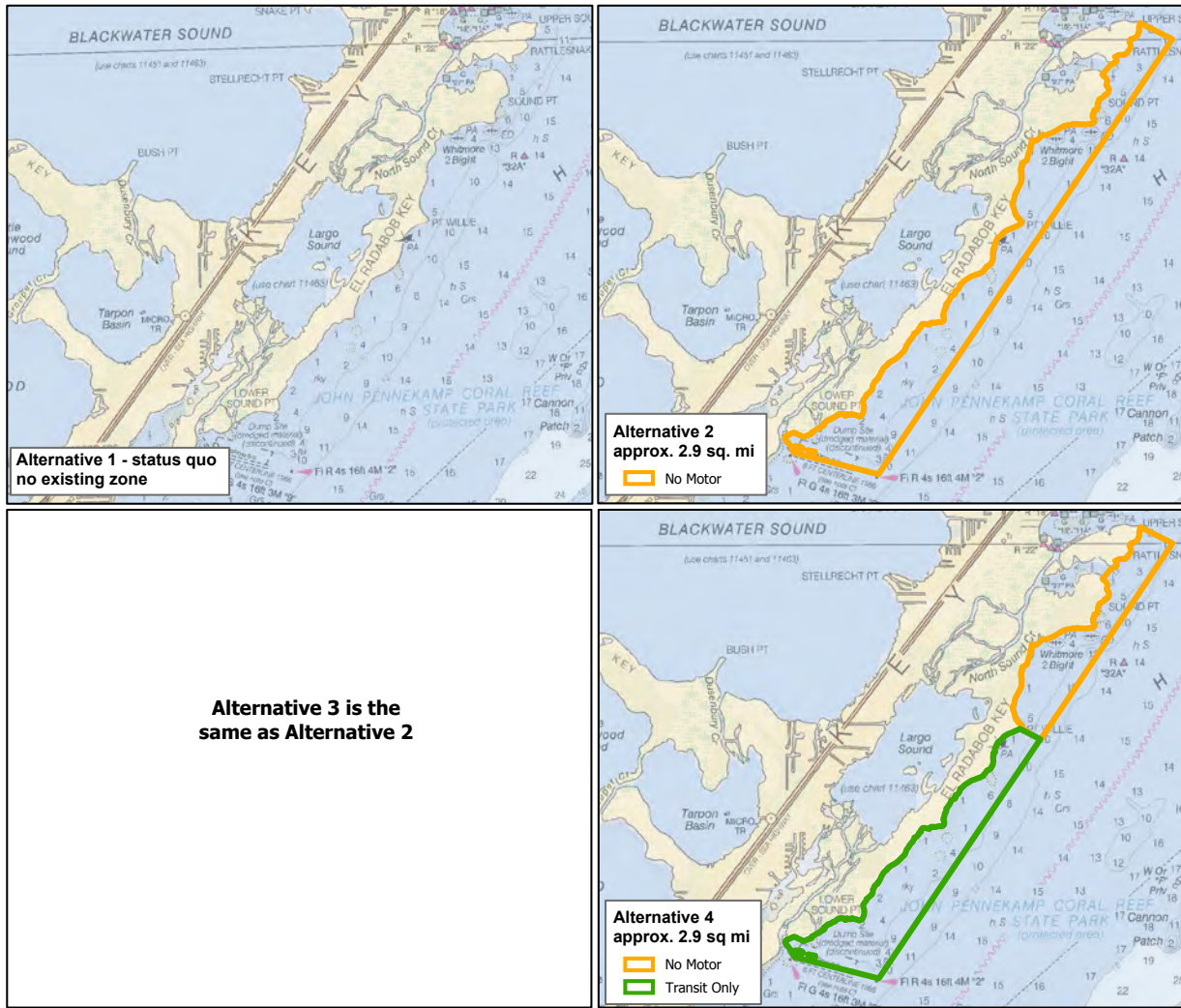


Protects an important reef community with a well-defined reef crest, spur-and-groove, and deeper multi-tiered linear reef system. Historically supported large stands of ESA-listed staghorn and elkhorn coral and contains remnant populations of these species that are undergoing recovery. This zone also contains several important shipwrecks included in the FKNMS Shipwreck Trail. This zone was originally designed to limit consumptive activities and separate users engaged in different activities.

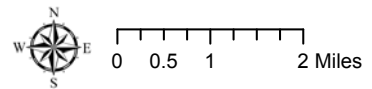
Upper Keys Region



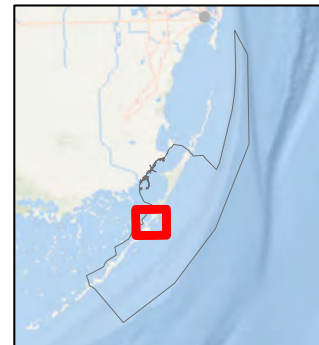
This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.



Rattlesnake Key and Whitmore Bight Wildlife Management Areas and El Radabob Key Conservation Area

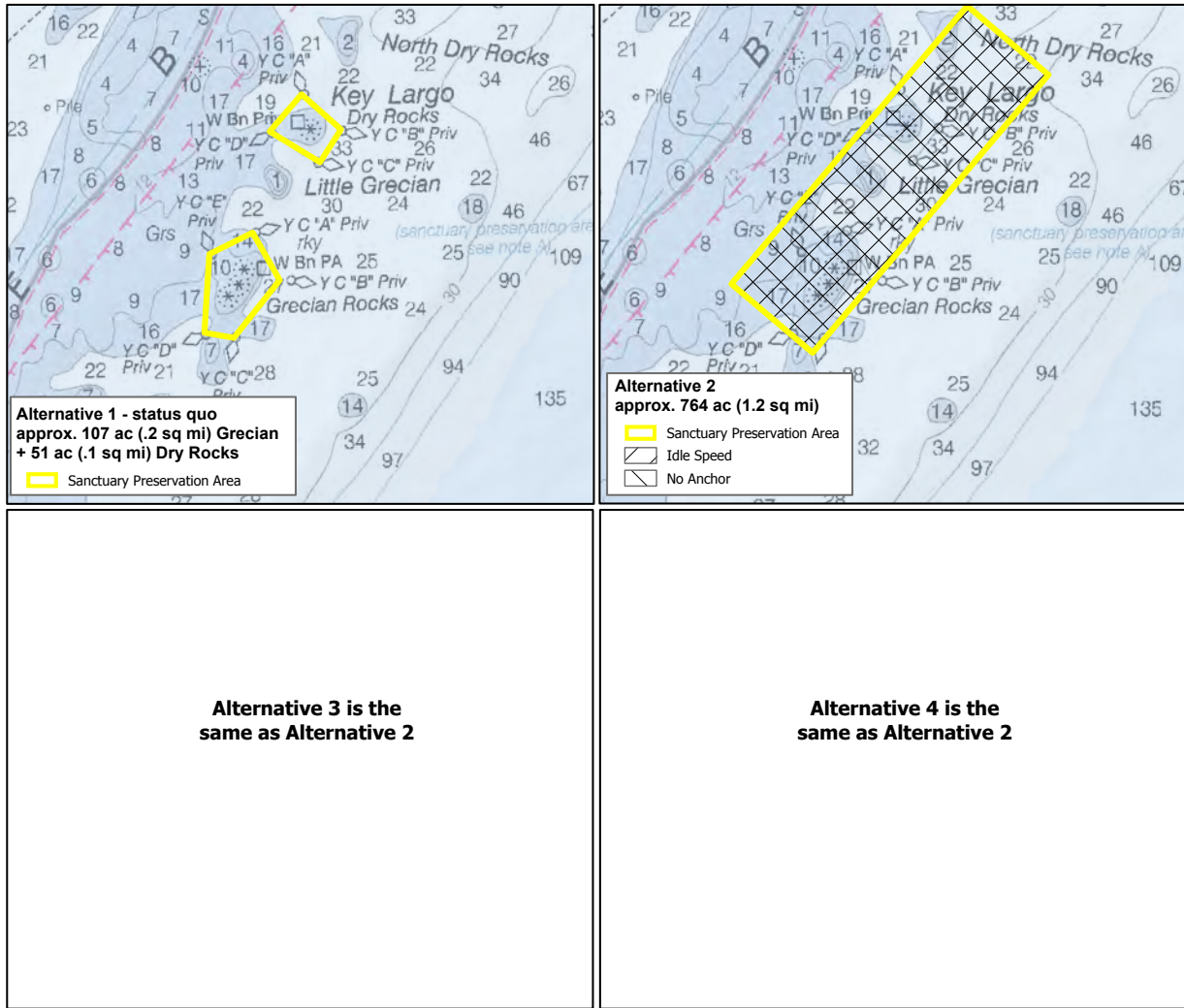


Upper Keys Region

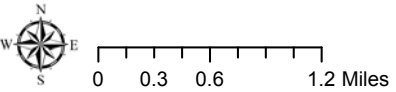


Decreases disturbance to the benthic community including hardbottom habitat that supports juvenile lobster and various reef and game fish.

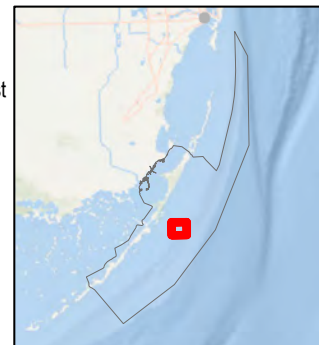
This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.



Key Largo Dry Rocks Sanctuary Preservation Area, Grecian Rocks Sanctuary Preservation Area, and Key Large Dry Rocks, Grecian Rocks, and North Rocks Sanctuary Preservation Area

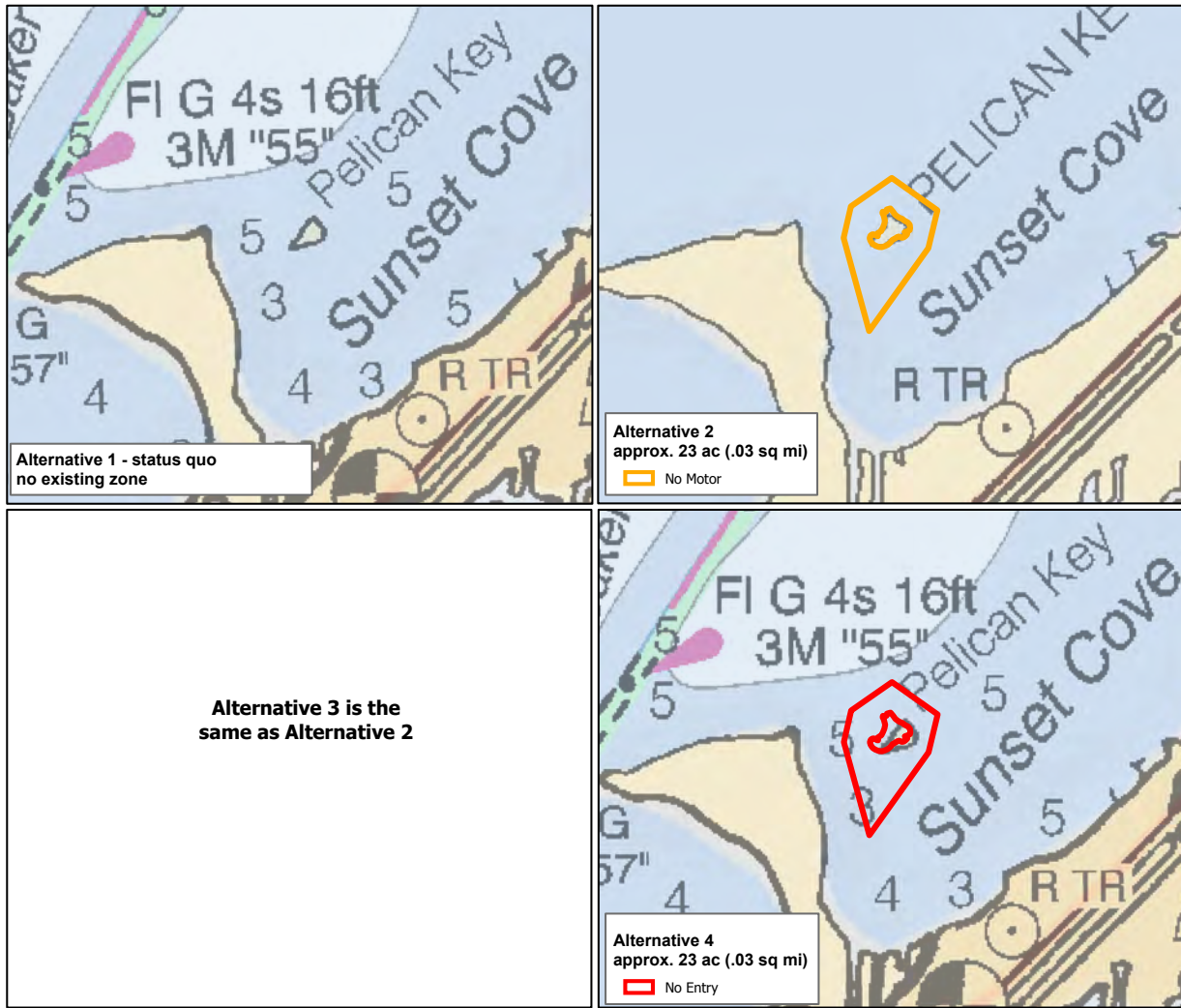


Upper Keys Region



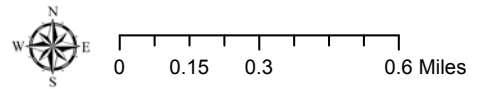
Encompasses spur-and-groove fore reef habitats, back reef and shallow reef crests, and small patch reefs that supported historical assemblages of ESA-listed staghorn and elkhorn corals. Contains one of the largest remaining healthy populations of ESA-listed star corals on outer reefs in the Upper Keys. Protects seagrass meadows that support large populations of herbivorous reef fish, queen conch, and long-spined sea urchins. Key Largo Dry Rocks contains the “Christ of the Deep” statue and includes one of the oldest *Acropora* restoration sites in the Florida Keys. Key Largo Dry Rocks and Grecian Rocks SPAs were originally designed to limit consumptive activities and separate users engaged in different activities.

This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

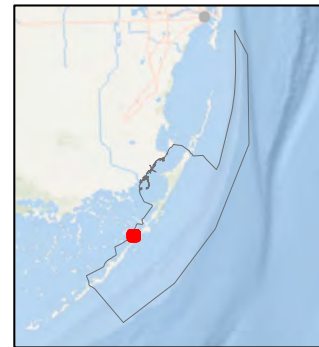


**Pelican Key
Wildlife Management Area**

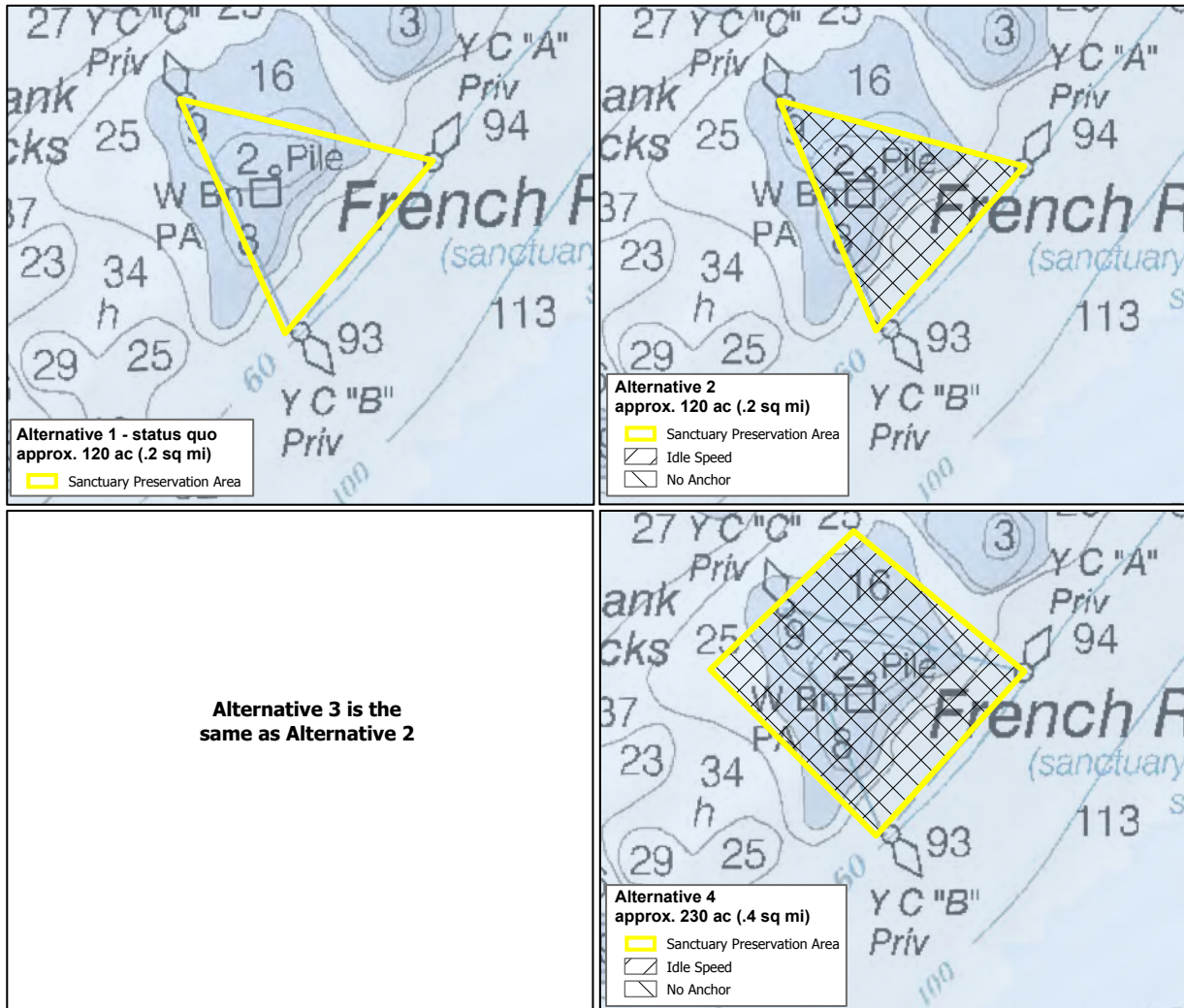
Protects shallow seagrasses. Decreases disturbance of manatees and roosting and wading birds including magnificent frigatebirds and pelicans.



Upper Keys Region



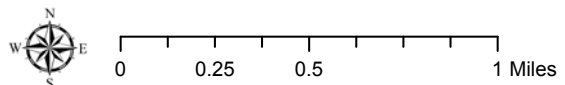
This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.



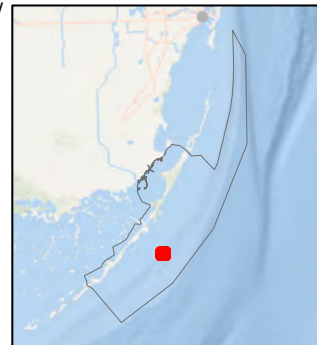
French Reef Sanctuary Preservation Area

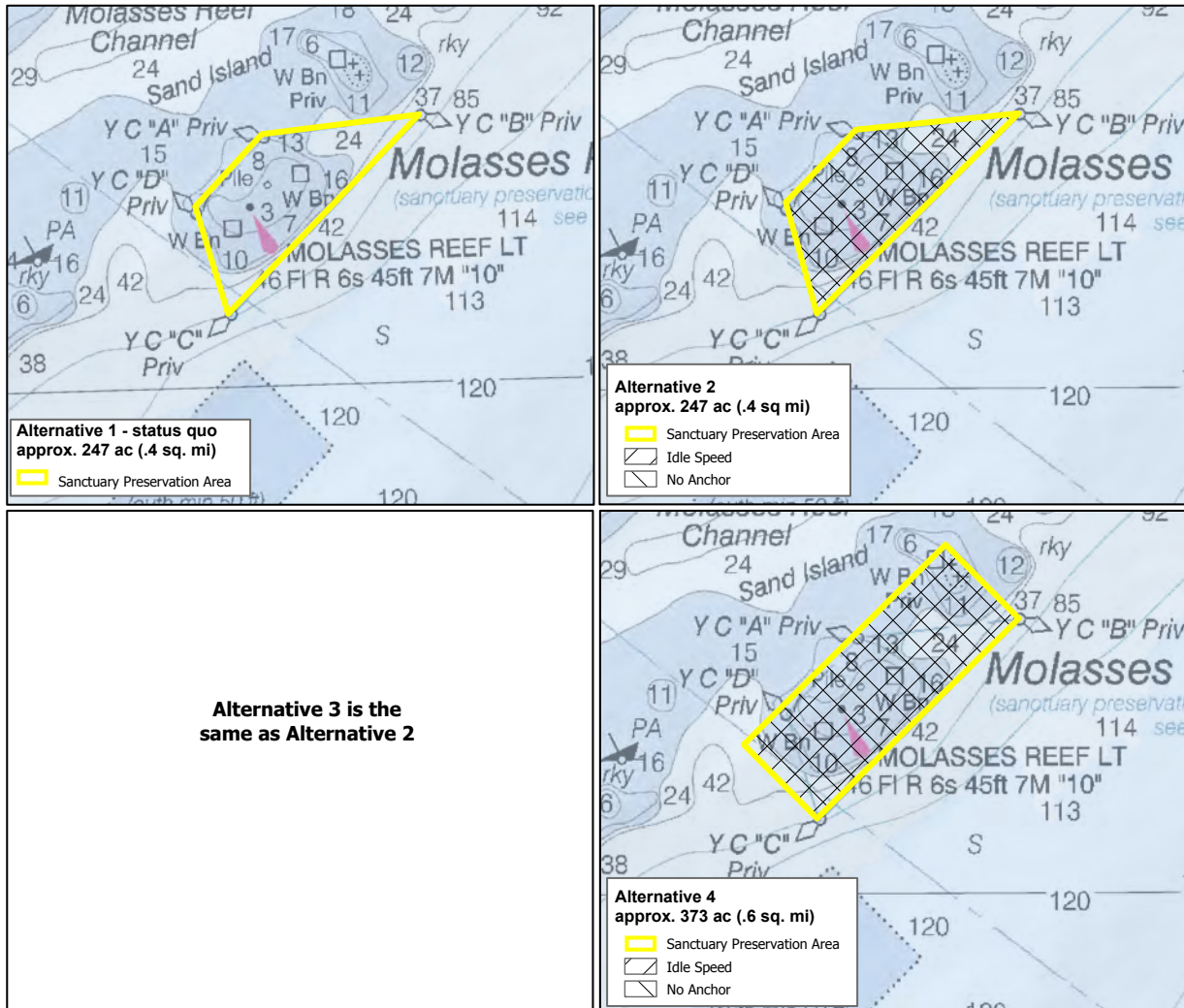
Protects well-developed, spur-and-groove reef system with unique cave and arch features that support large populations of schooling grunts and snappers as well as groupers and other reef predators. Historically supported large populations of ESA-listed staghorn and elkhorn corals. This zone was originally designed to limit consumptive activities and separate users engaged in different activities.

This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.



Upper Keys Region

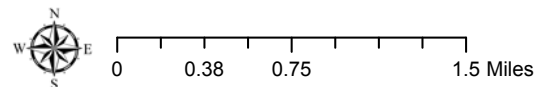




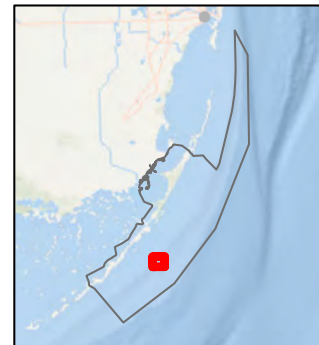
Molasses Reef Sanctuary Preservation Area

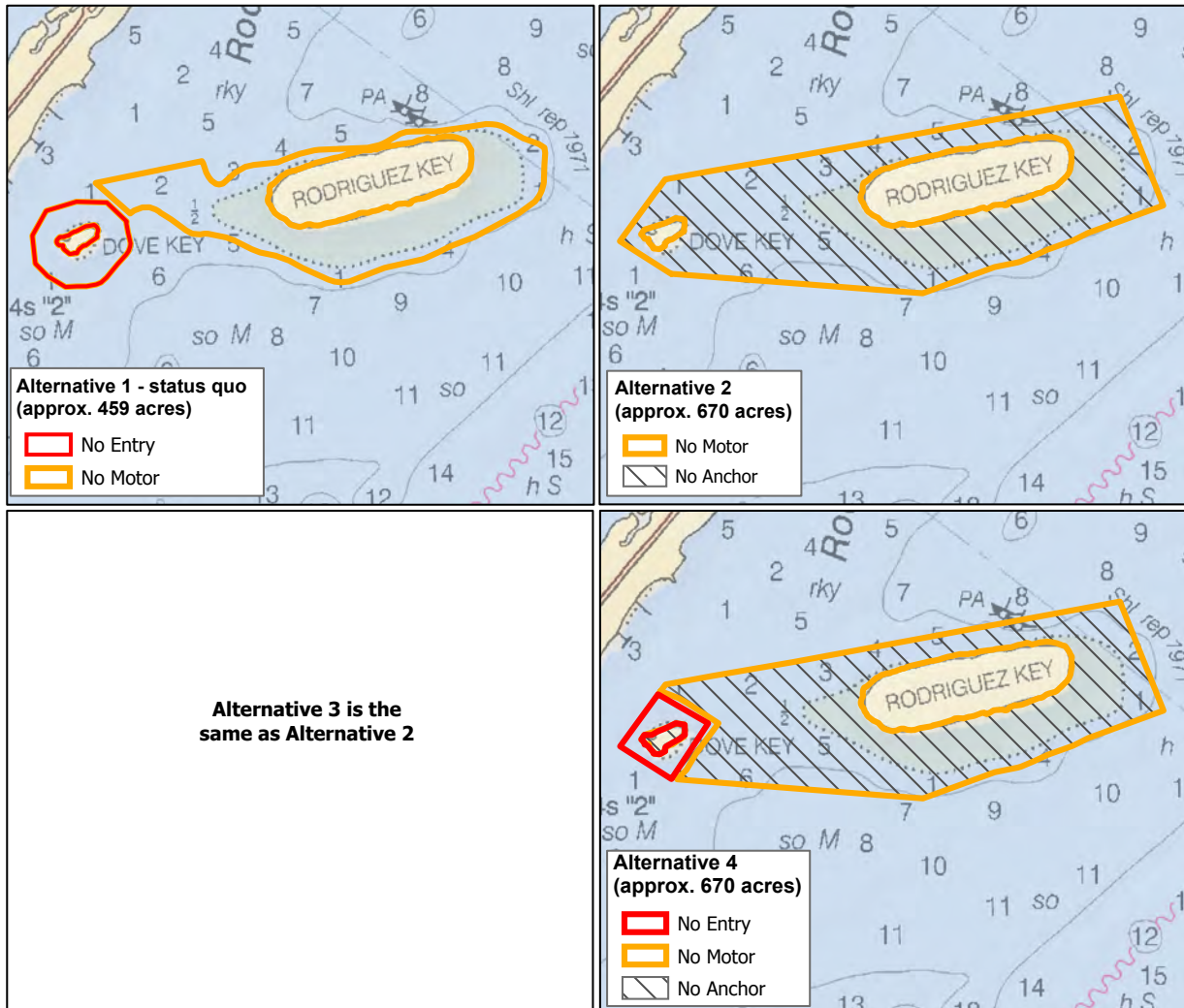
Protects a well-developed, spur-and-groove system and a deep reef wall with a historic presence of ESA-listed staghorn and elkhorn corals, as well as a population of large ESA-listed star corals. Contains several famous shipwreck sites and is an important research site with long-term temperature data and coral monitoring stations, and ongoing ESA-listed staghorn and elkhorn coral restoration activities. This is the most heavily-used site for recreational scuba diving in the Upper Keys. The historic Molasses Reef light is included in this SPA. This zone was originally designed to limit consumptive activities and separate users engaged in different activities.

This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.



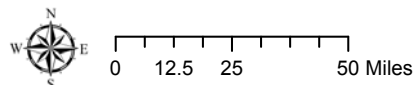
Upper Keys Region



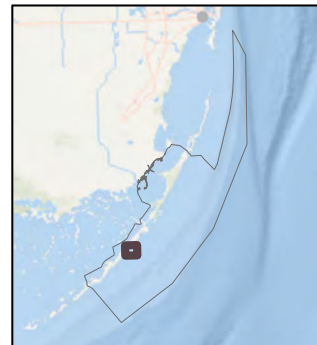


Dove Key and Rodriguez Key Wildlife Management Areas

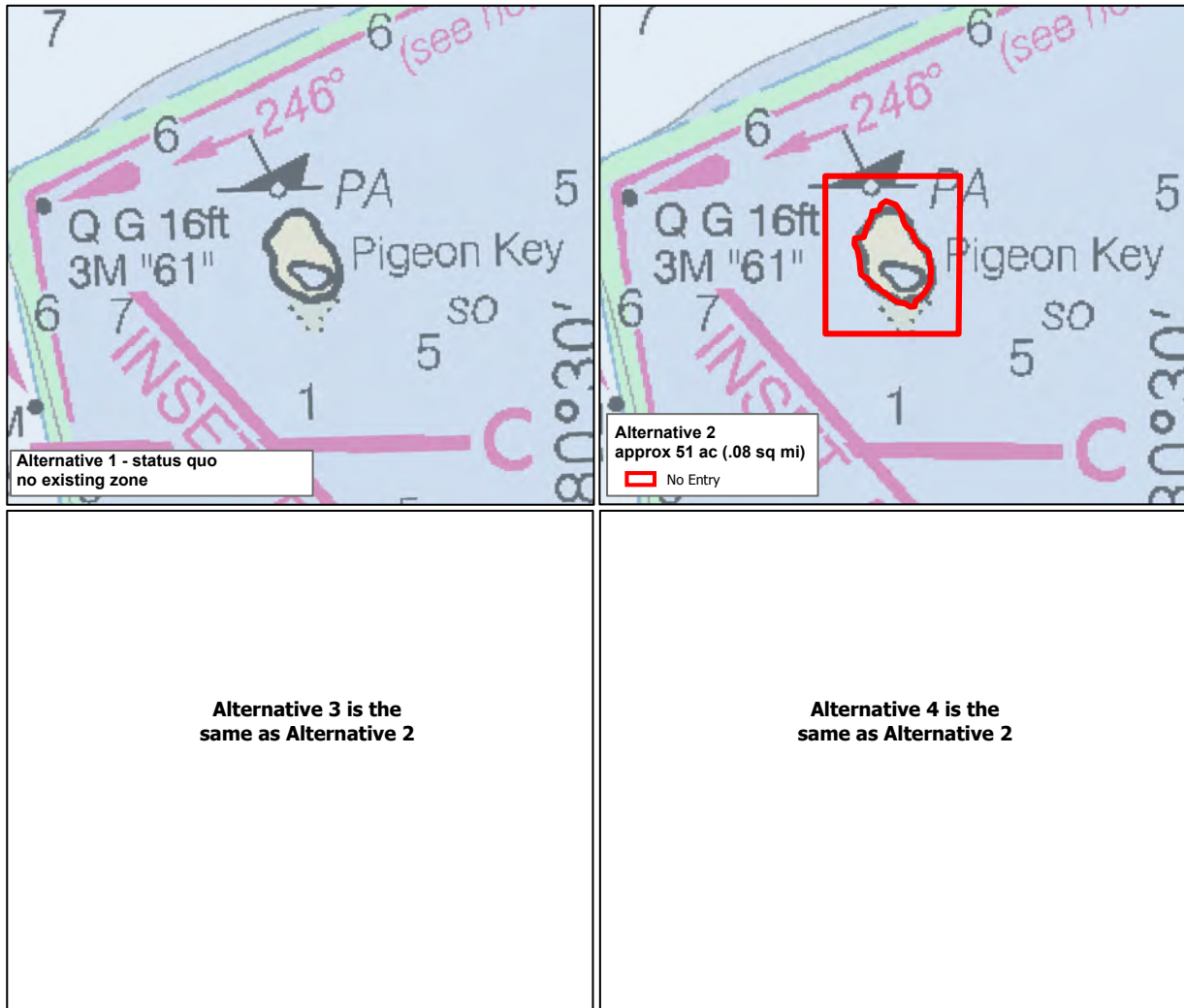
Decreases disturbance of a variety of birds and fish, including bonefish, and the benthic community including seagrass and hardbottom habitat. The shallow seagrass flats in this area have been impacted by vessel groundings and exhibit light-to-severe prop scarring.



Upper Keys Region

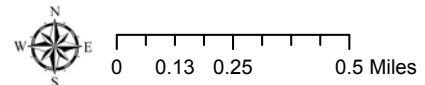


Note: This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

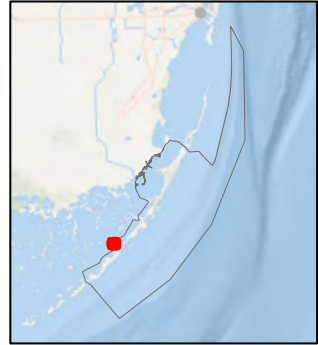


**Pigeon Key
Wildlife Management Area**

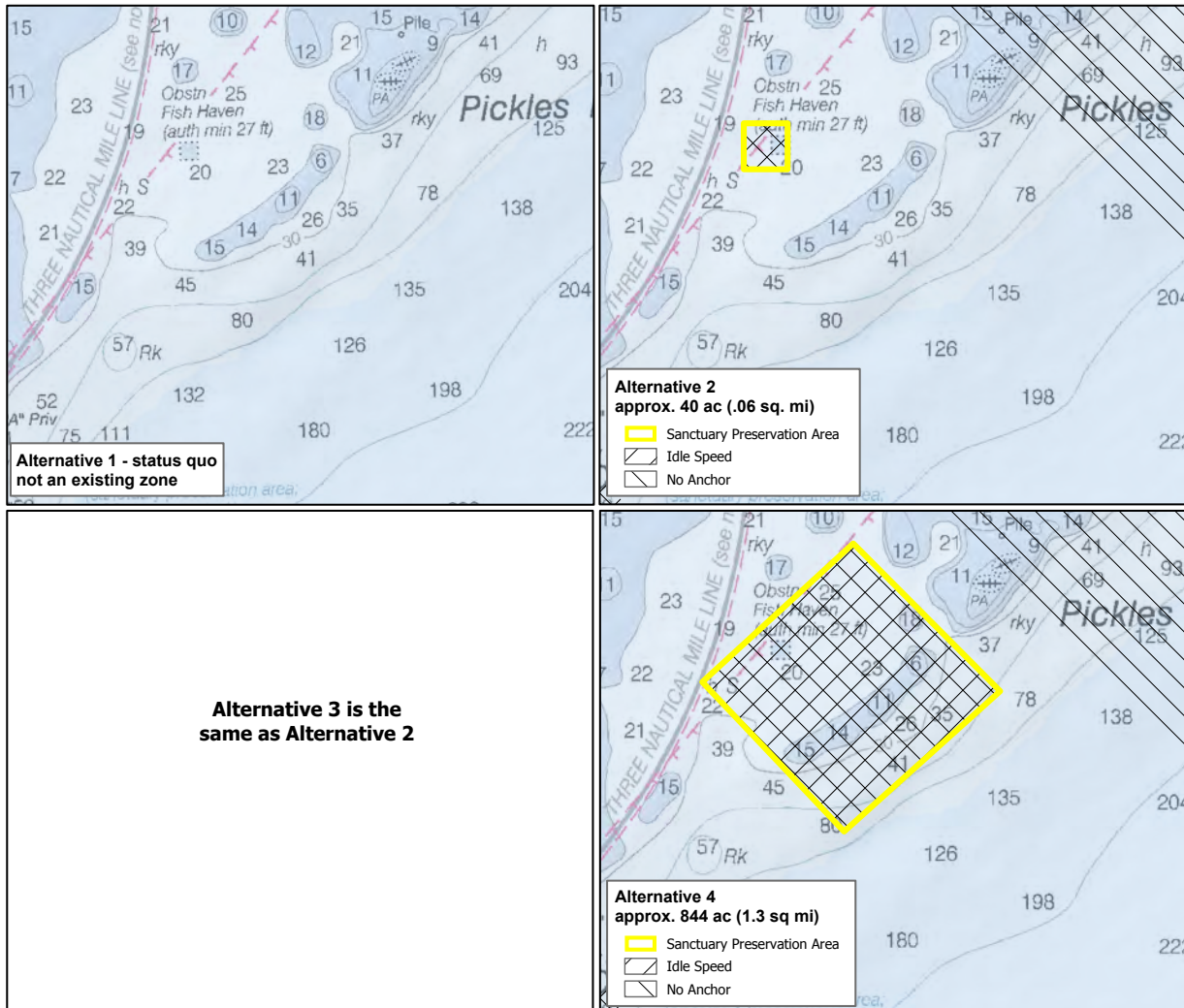
Decreases disturbance to mangrove terrapins, mangrove salt marsh snakes, nesting and wading birds including roseate spoonbills, and roosting magnificent frigatebirds in a very important wading bird nesting area. This area is in close proximity to the Intracoastal Waterway.



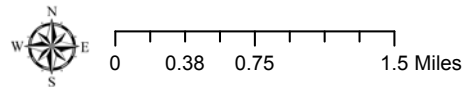
Upper Keys Region



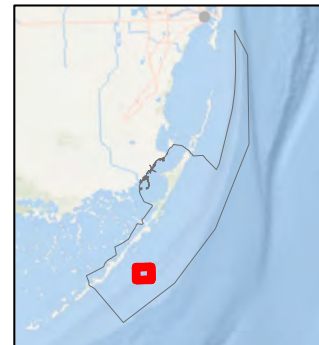
This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.



Pickles Reef Sanctuary Preservation Area and Snapper Ledge Sanctuary Preservation Area



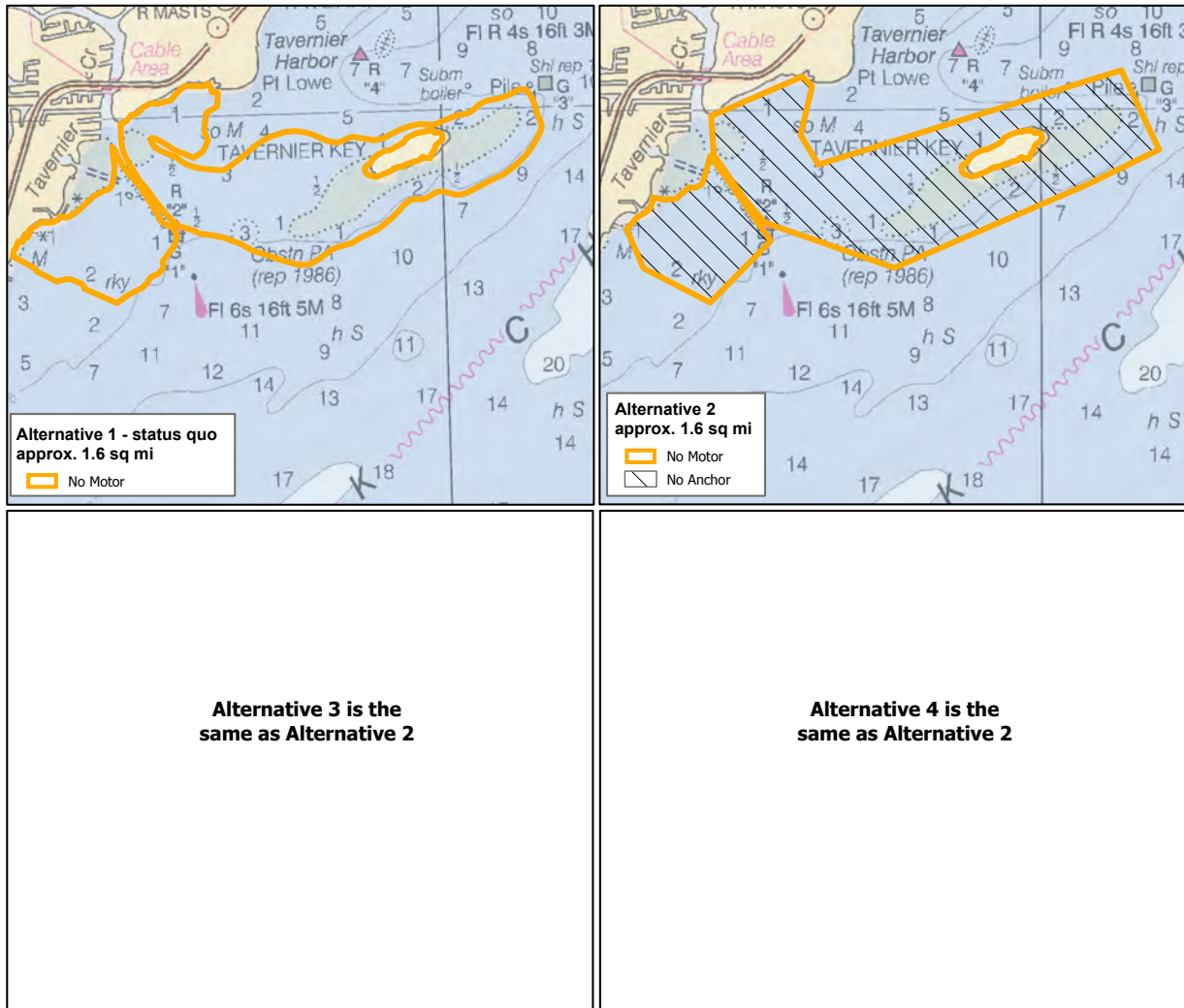
Upper Keys Region



Pickles Reef SPA protects an important spur-and-groove habitat that includes a shallow reef crest, sloping reef community, and a deeper, drowned spur-and-groove habitat with a historic presence of ESA-listed elkhorn, staghorn, and pillar corals, as well as several highly-visited shipwreck sites. This is an active site for staghorn coral restoration and provides an area for restoration of degraded coral reef ecosystem sanctuary resources.

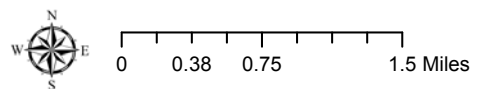
Snapper Ledge SPA protects an important spur-and-groove community with large undercut ledges and swim-throughs that support large populations of schooling grunts and snappers. Historically supported ESA-listed staghorn and elkhorn coral populations and is a long-term restoration site for both of the species.

This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

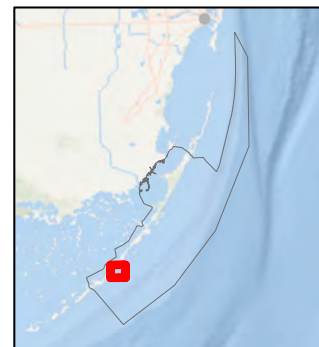


Tavernier Key Wildlife Management Areas

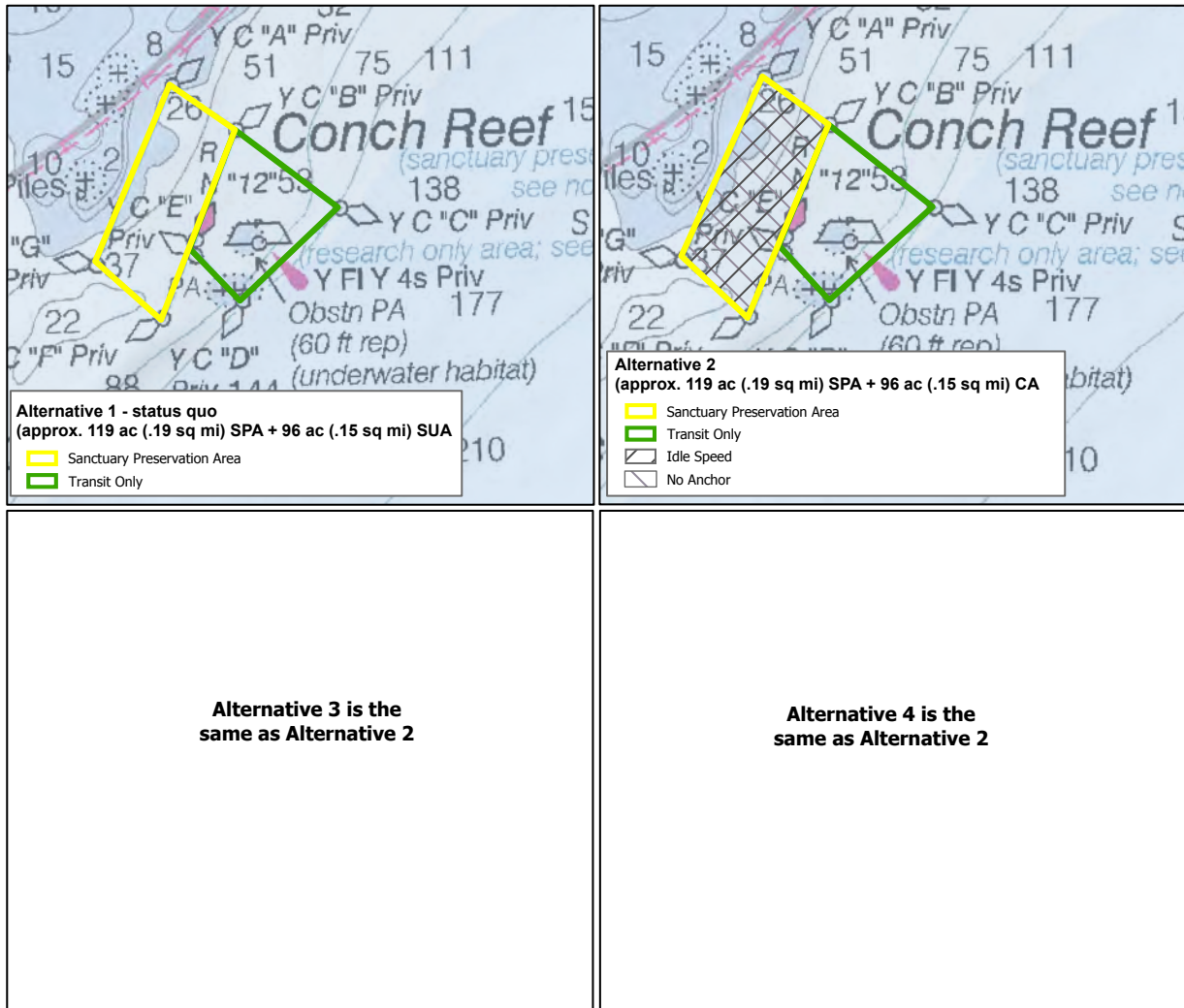
Decreases disturbance to wading, roosting and nesting birds and fish including bonefish. Decreases disturbance to the benthic community including seagrass and hardbottom habitat. The shallow seagrass flats in this area have been impacted by vessel groundings and exhibit light-to-severe prop scarring.



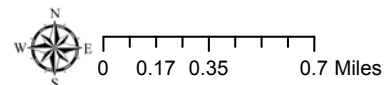
Upper Keys Region



This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.



Conch Reef Sanctuary Preservation Area and Conch Reef Special Use Area/Conservation Area

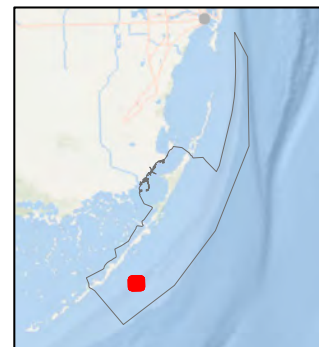


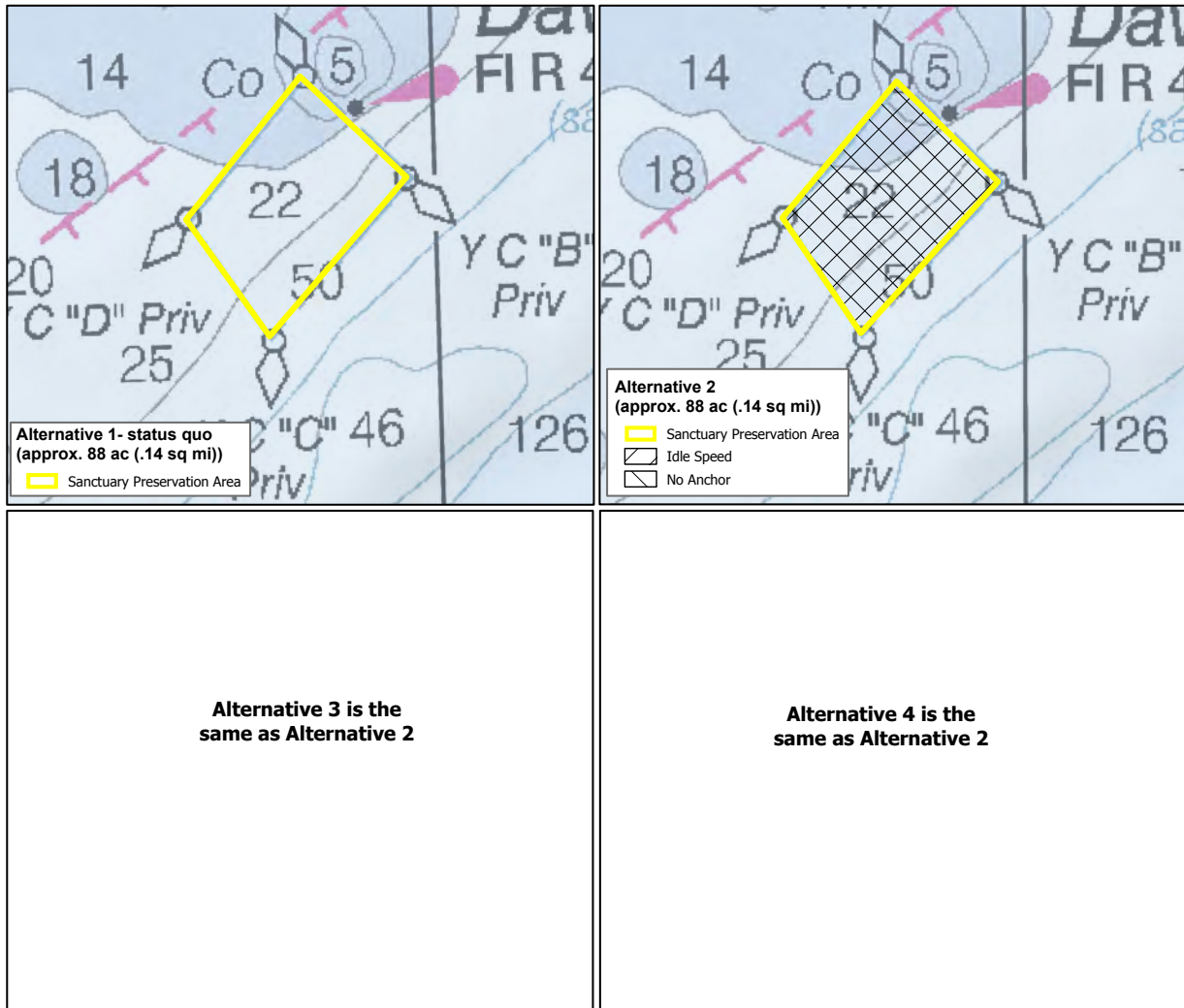
Conch Reef SPA protects an area with diverse coral species and one of the best developed reef wall systems in the Florida Keys. It contains good conch habitat and has historically contained well developed stands of pillar coral. This zone was originally designed to limit consumptive activities and separate users engaged in different activities.

Conch Reef SUA protects an aggregated patch reef system with limited spur-and-groove development and a well developed reef wall system that contains historic populations of ESA-listed elkhorn, staghorn, and pillar corals. Also includes associated hardbottom and seagrass habitats that support queen conch and lobster populations. This zone encompasses the Aquarius Reef Base underwater laboratory. This zone was originally established to limit use and allow scientists to differentiate impacts caused by use and those caused by changing environmental conditions.

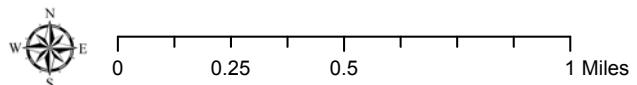
This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

Upper Keys Region



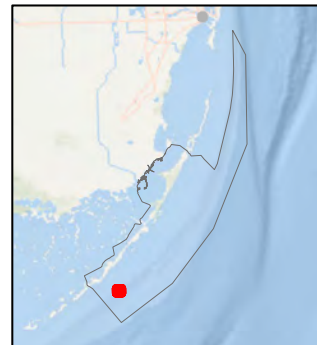


Davis Reef Sanctuary Preservation Area

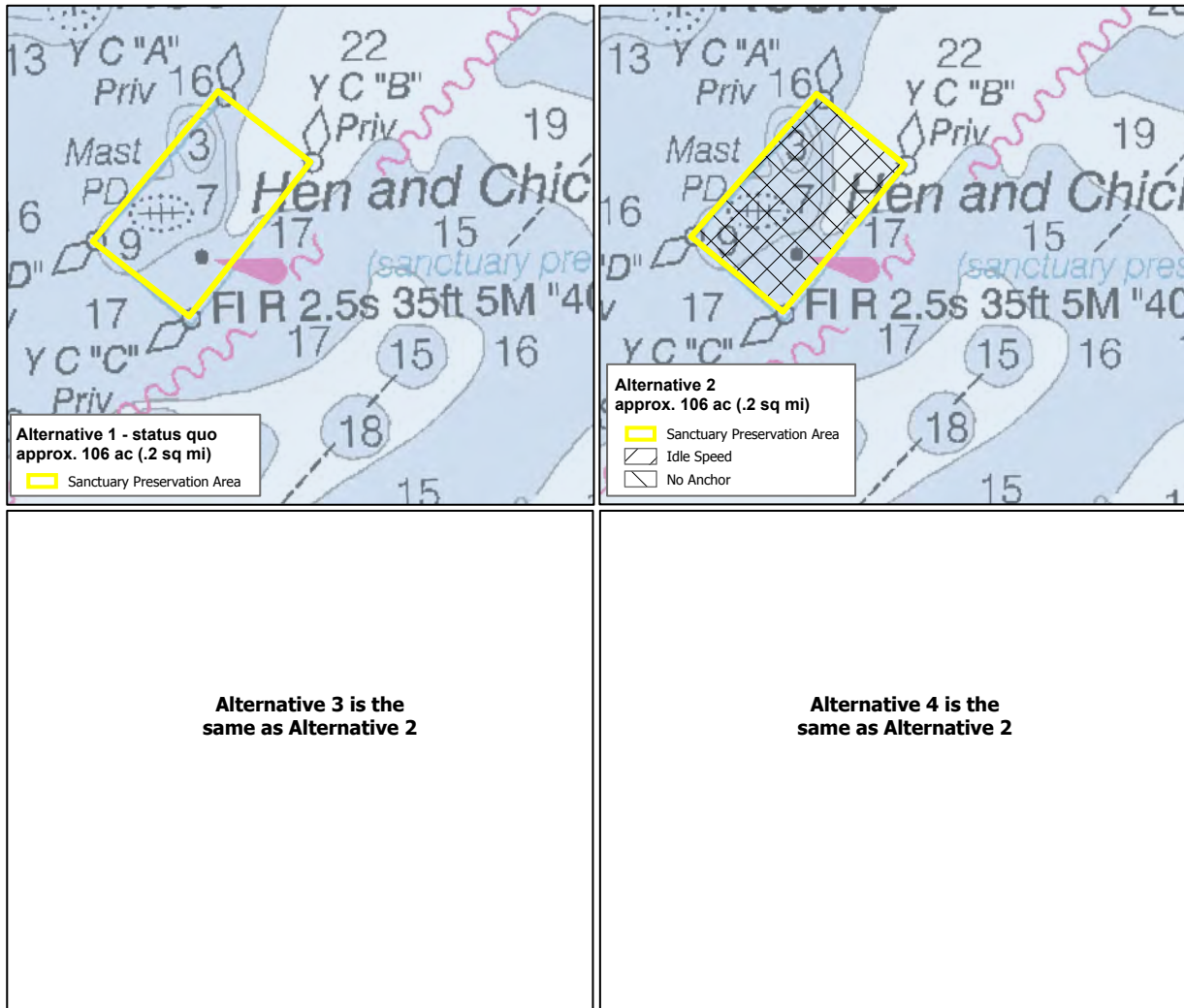


Protects a spur-and-groove fore reef, with a prominent rubble berm back reef, that drops off to a well-developed, intermediate, drowned spur-and-groove reef. This zone includes a coral restoration project site. This zone was originally designed to limit consumptive activities and separate users engaged in different activities.

Upper Keys Region

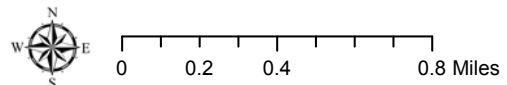


This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

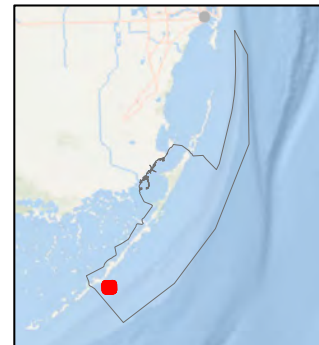


Hen and Chickens Sanctuary Preservation Area

Protects a unique, mid-channel patch reef off Plantation Key within Hawk Channel with large populations of ESA-listed star corals as well as brain corals, and remnant patches of ESA-listed staghorn corals. This zone was originally designed to limit consumptive activities and separate users engaged in different activities.



Upper Keys Region

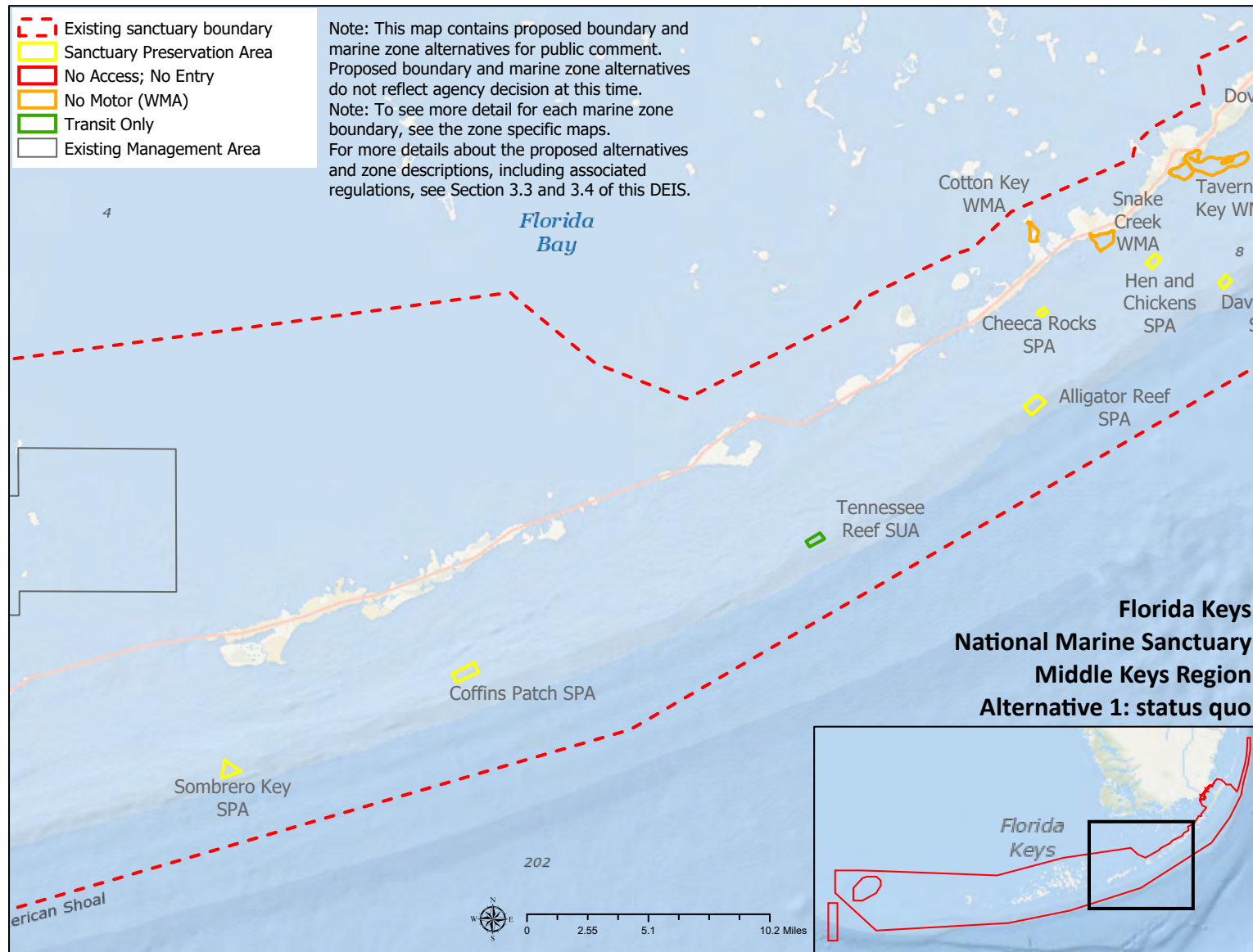


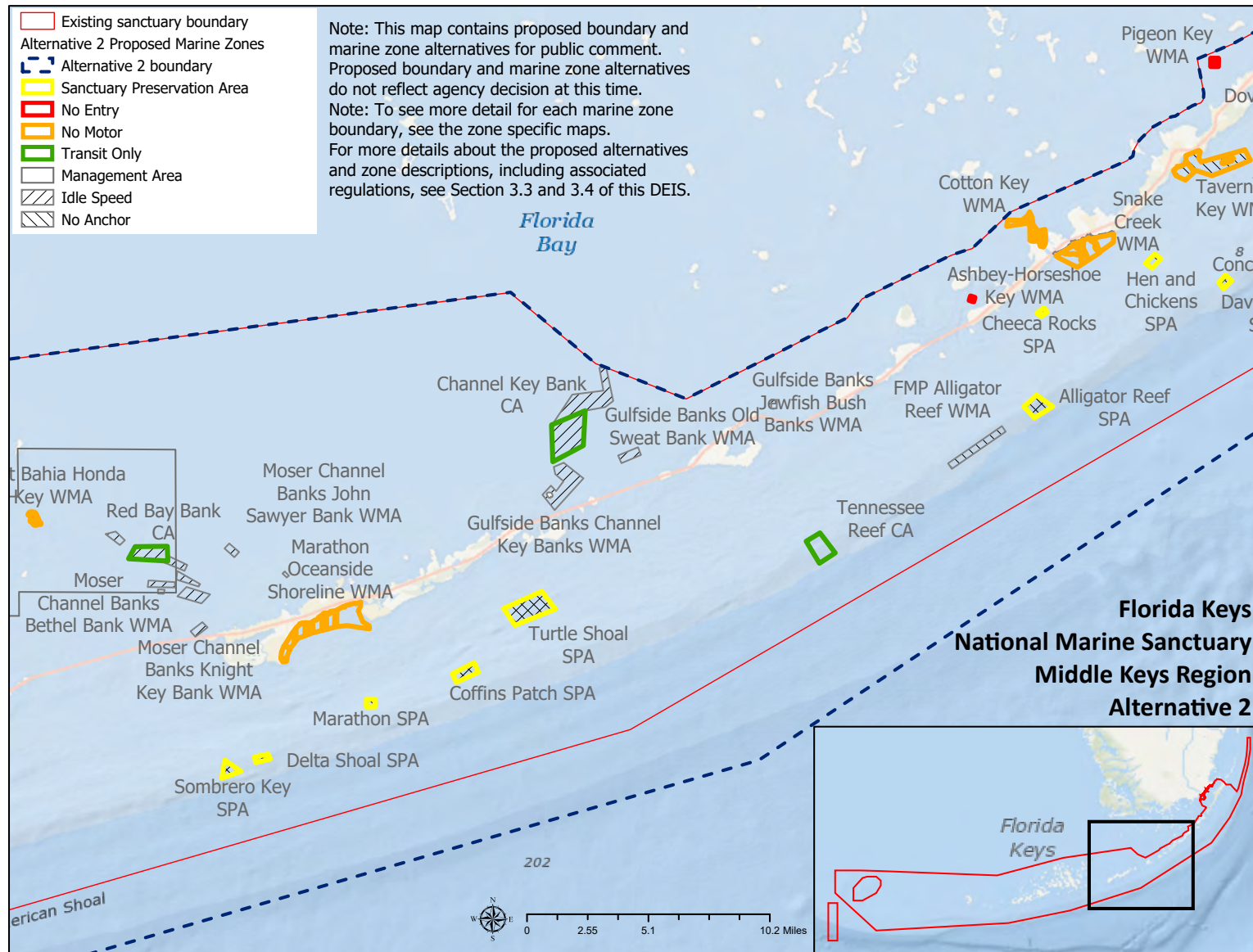
This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

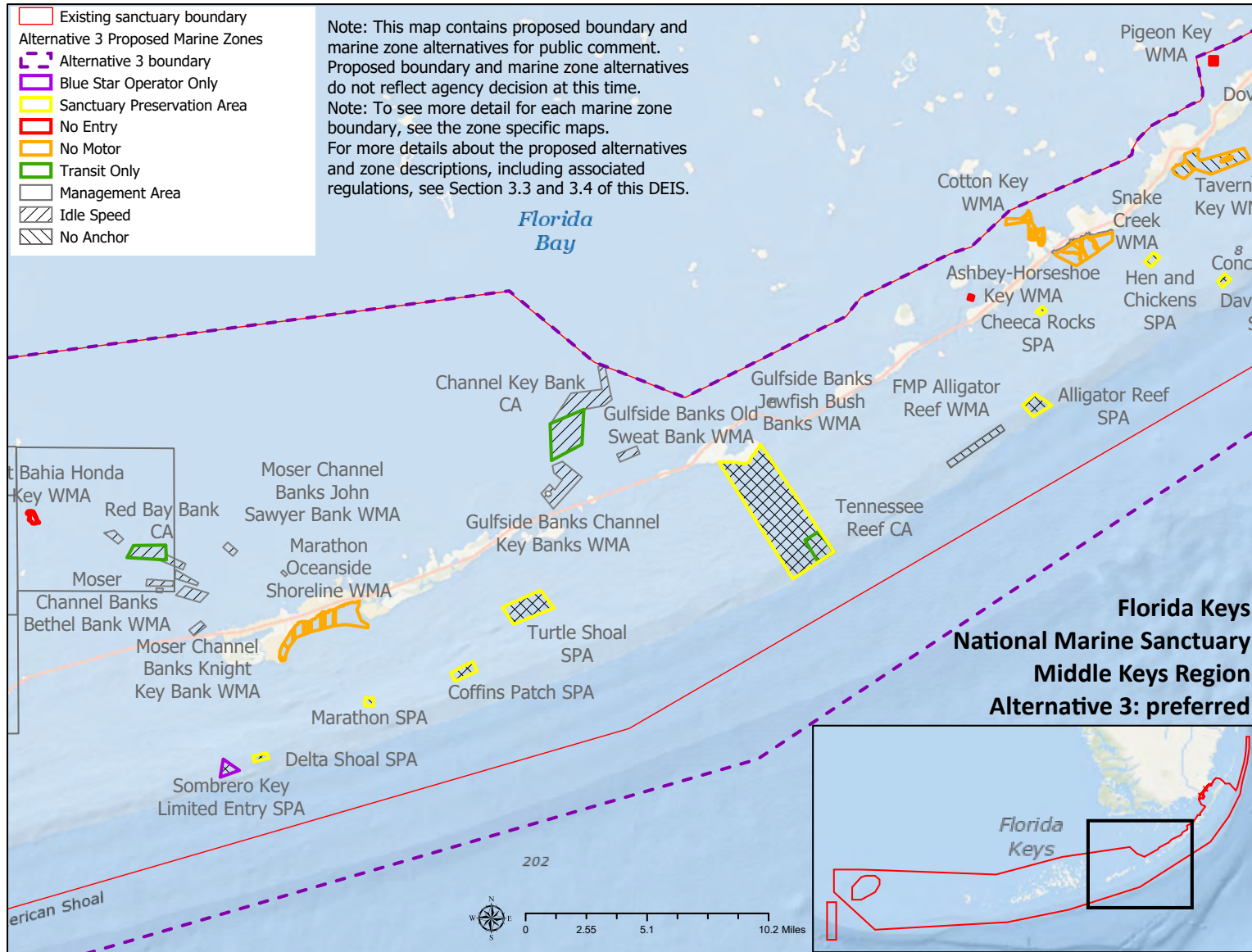
3.6.3 Middle Keys Region and Middle Keys marine zone alternatives

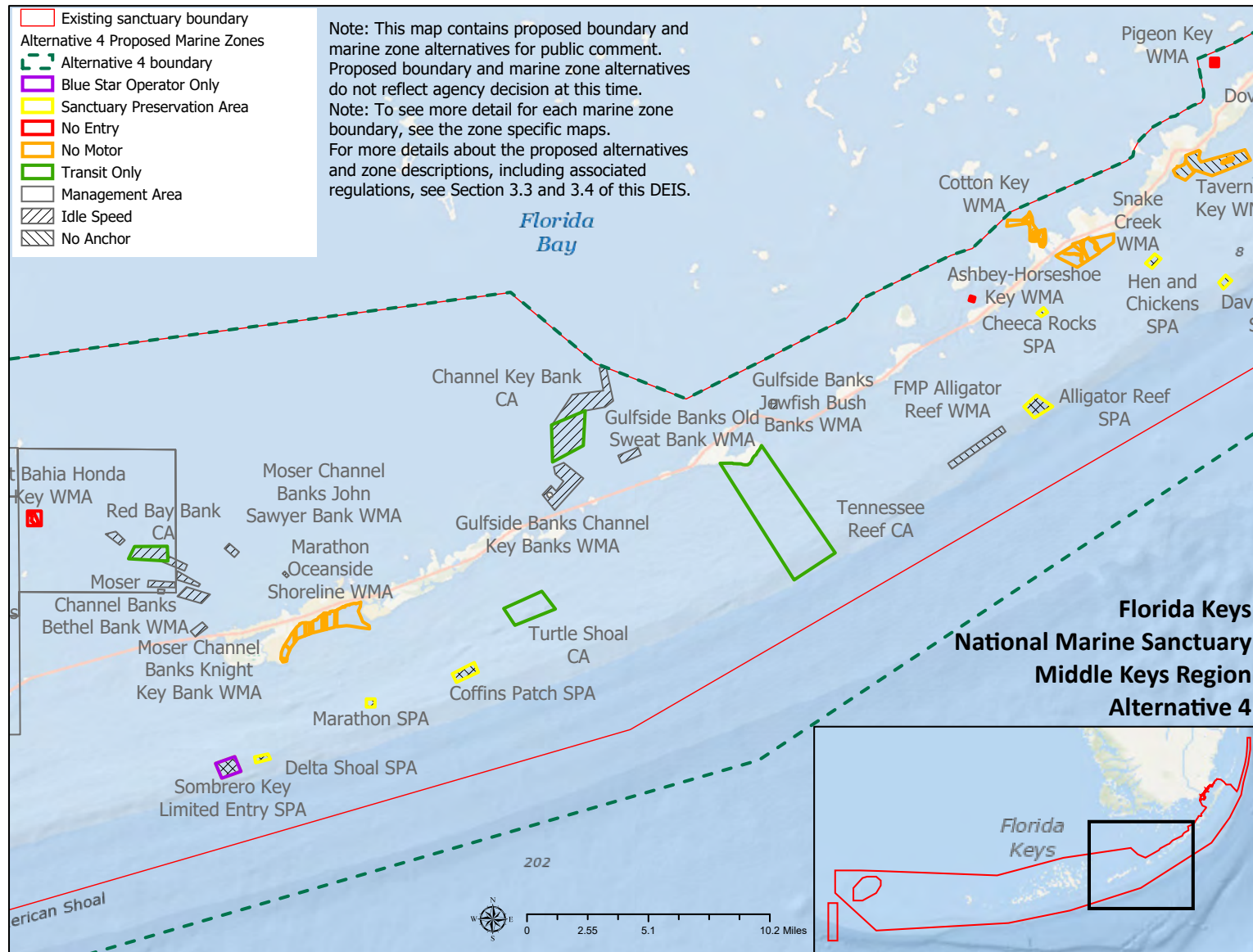


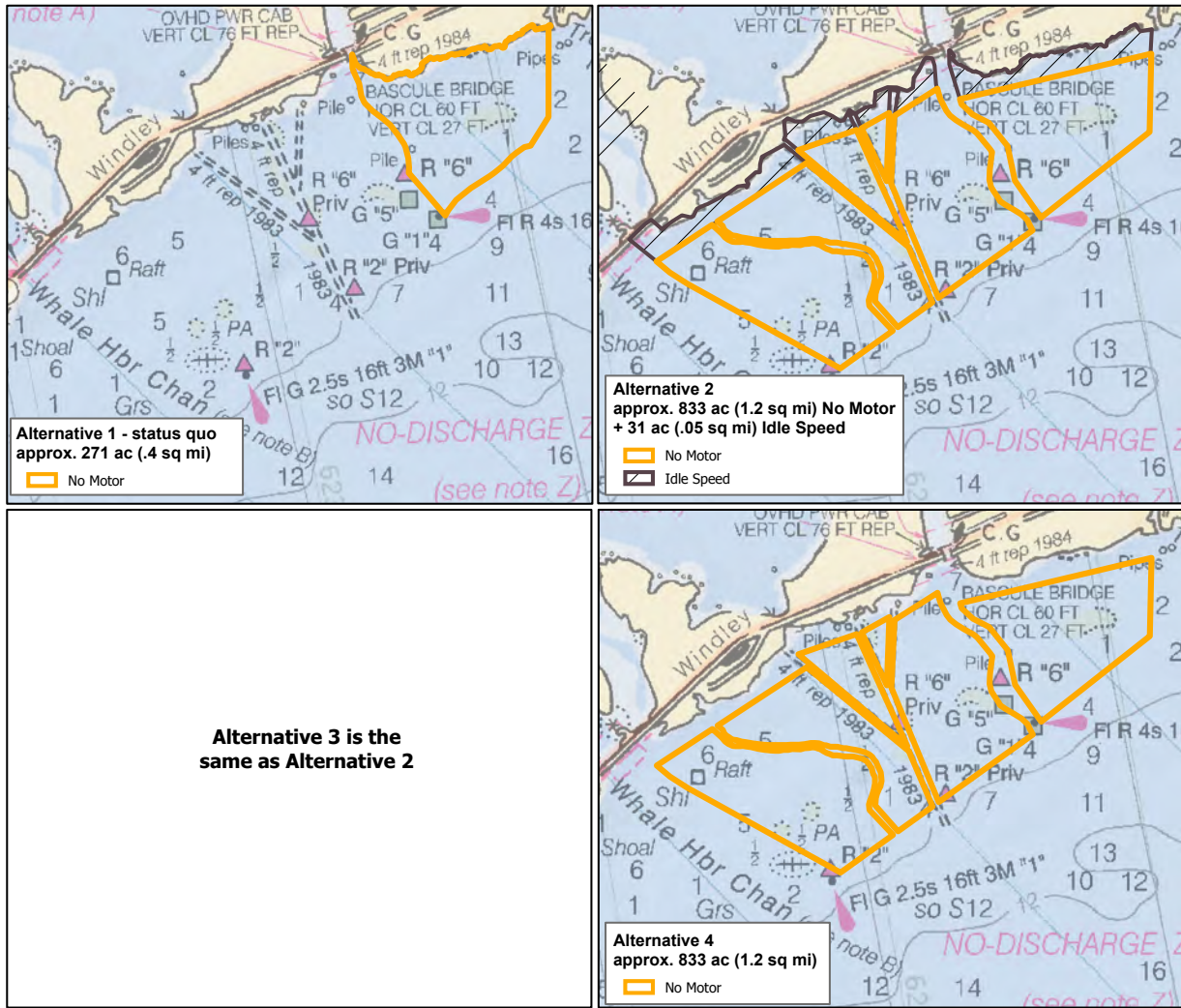
The iconic Seven Mile Bridge crosses the channel, delineating the Lower and Middle Florida Keys. Photo: Andy Newman/Florida Keys News Bureau





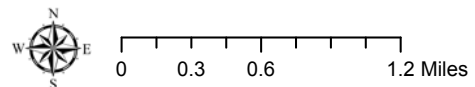






Snake Creek Wildlife Management Area

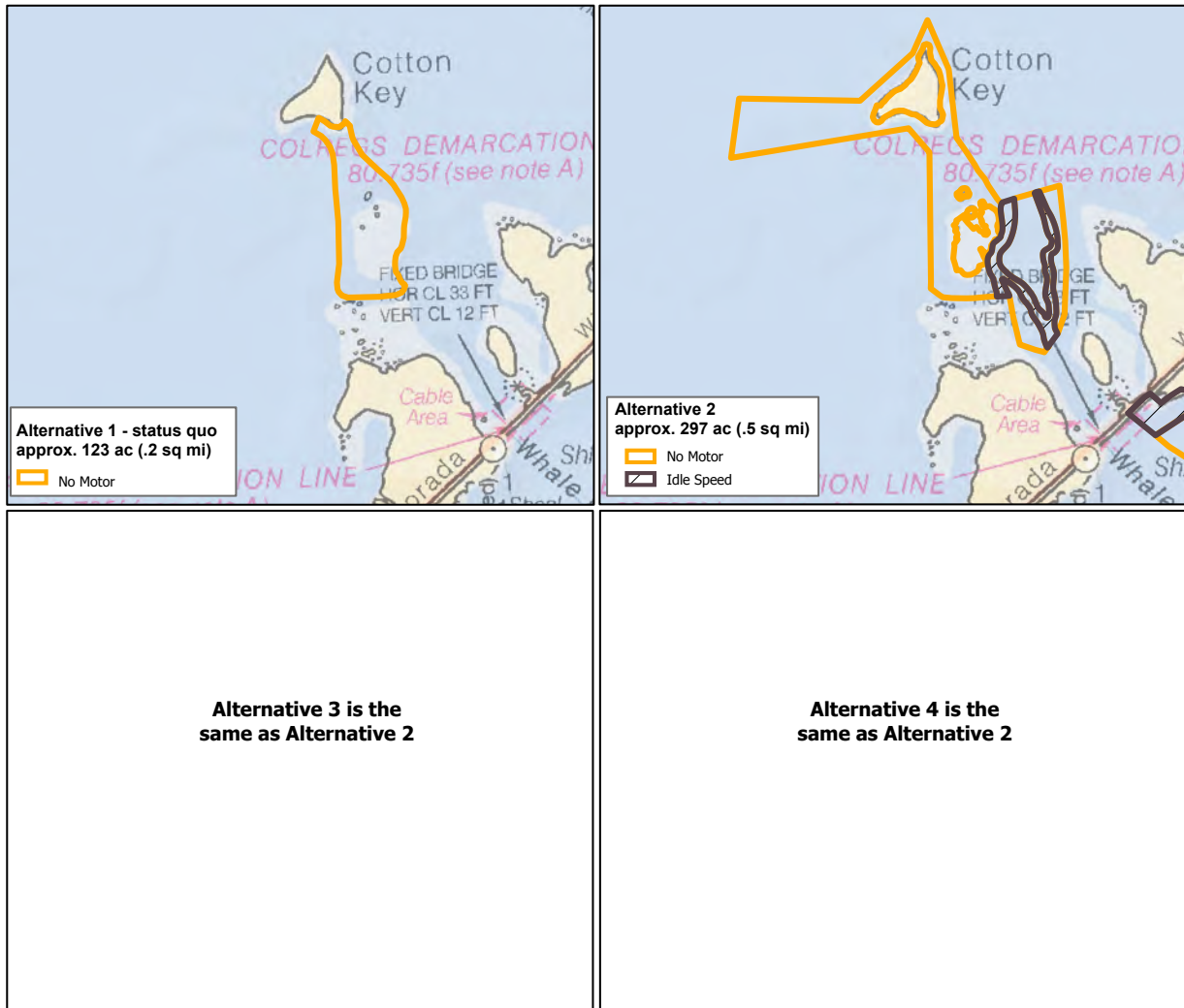
Decreases disturbance of birds using the area for nesting, roosting, and foraging. Protects shallow water habitat used by bonefish, permit, tarpon, and other fish species. The shallow seagrass flats have been impacted by vessel groundings and exhibit light-to-severe prop scarring.



Middle Keys Region

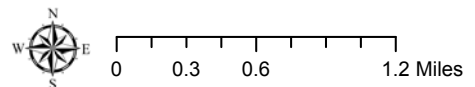


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Cotton Key Wildlife Management Area

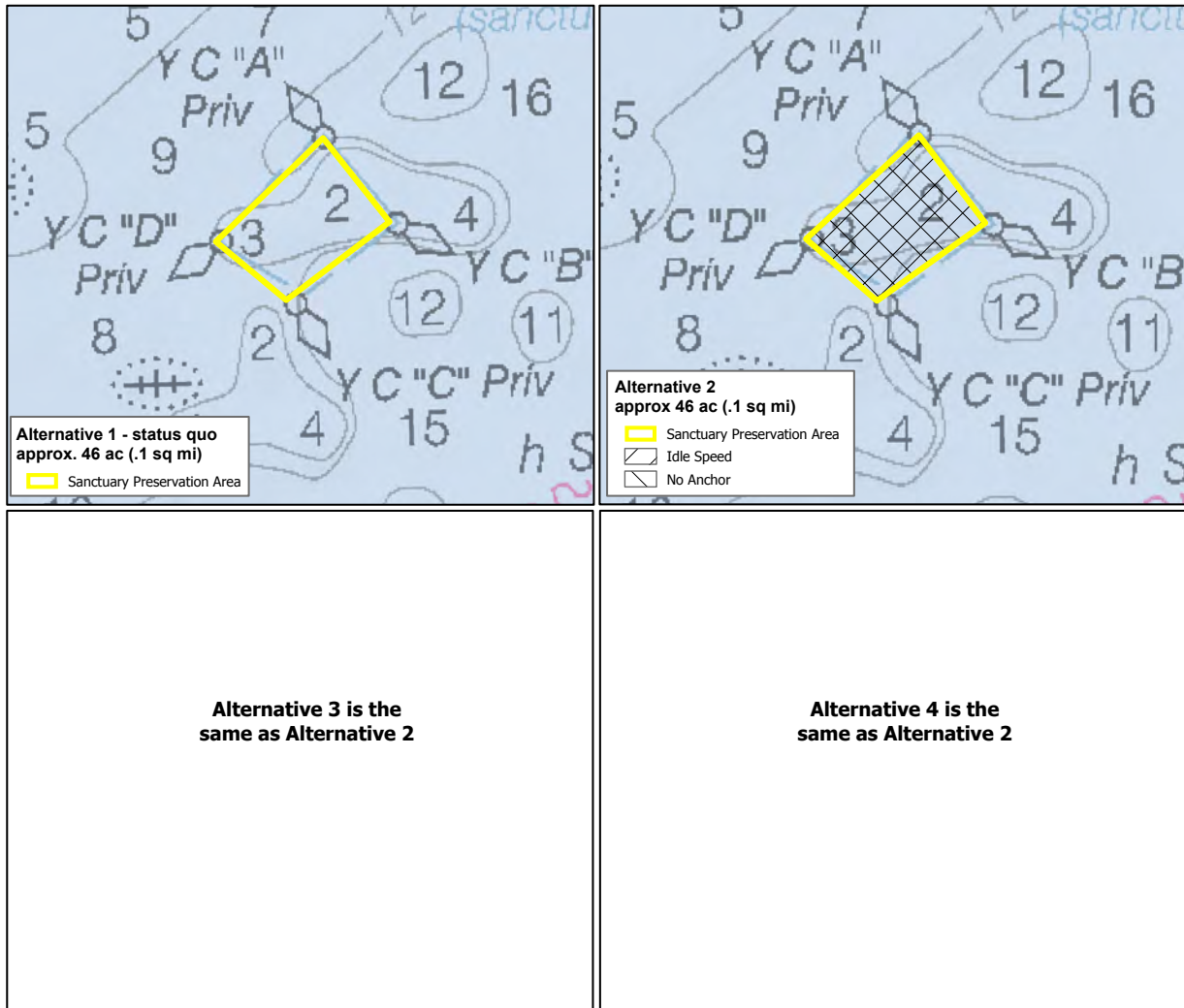
Decreases disturbance of nesting and roosting pelicans, cormorants, several heron species, magnificent frigatebirds, bonefish, and other fish species. The shallow seagrass flats have been impacted by vessel groundings and exhibit light-to-severe prop scarring.



Middle Keys Region



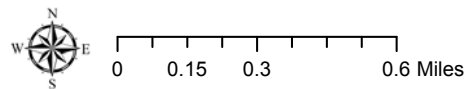
This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.



Cheeca Rocks Sanctuary Preservation Area

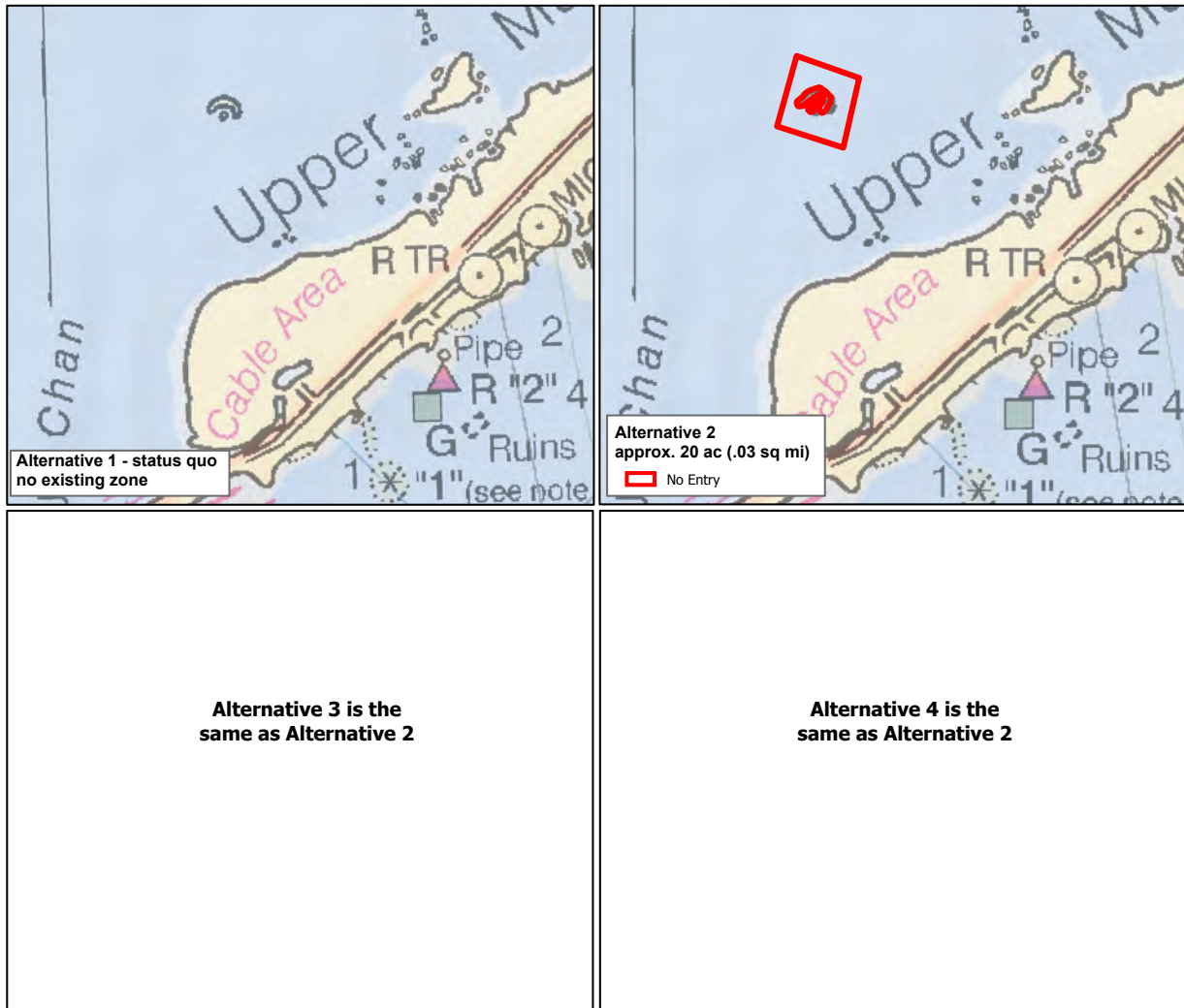
Protects highly-resilient aggregate and isolated patch reef habitats dominated by large populations of ESA-listed star corals along with a high diversity of other boulder corals. This is an important site for ongoing climate change studies and an important refuge from cold water events, bleaching, and coral disease. This zone was originally designed to limit consumptive activities and separate users engaged in different activities.

This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.



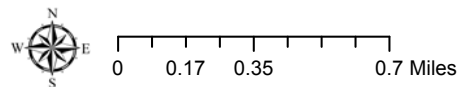
Middle Keys Region





Ashbey - Horseshoe Key Wildlife Management Area

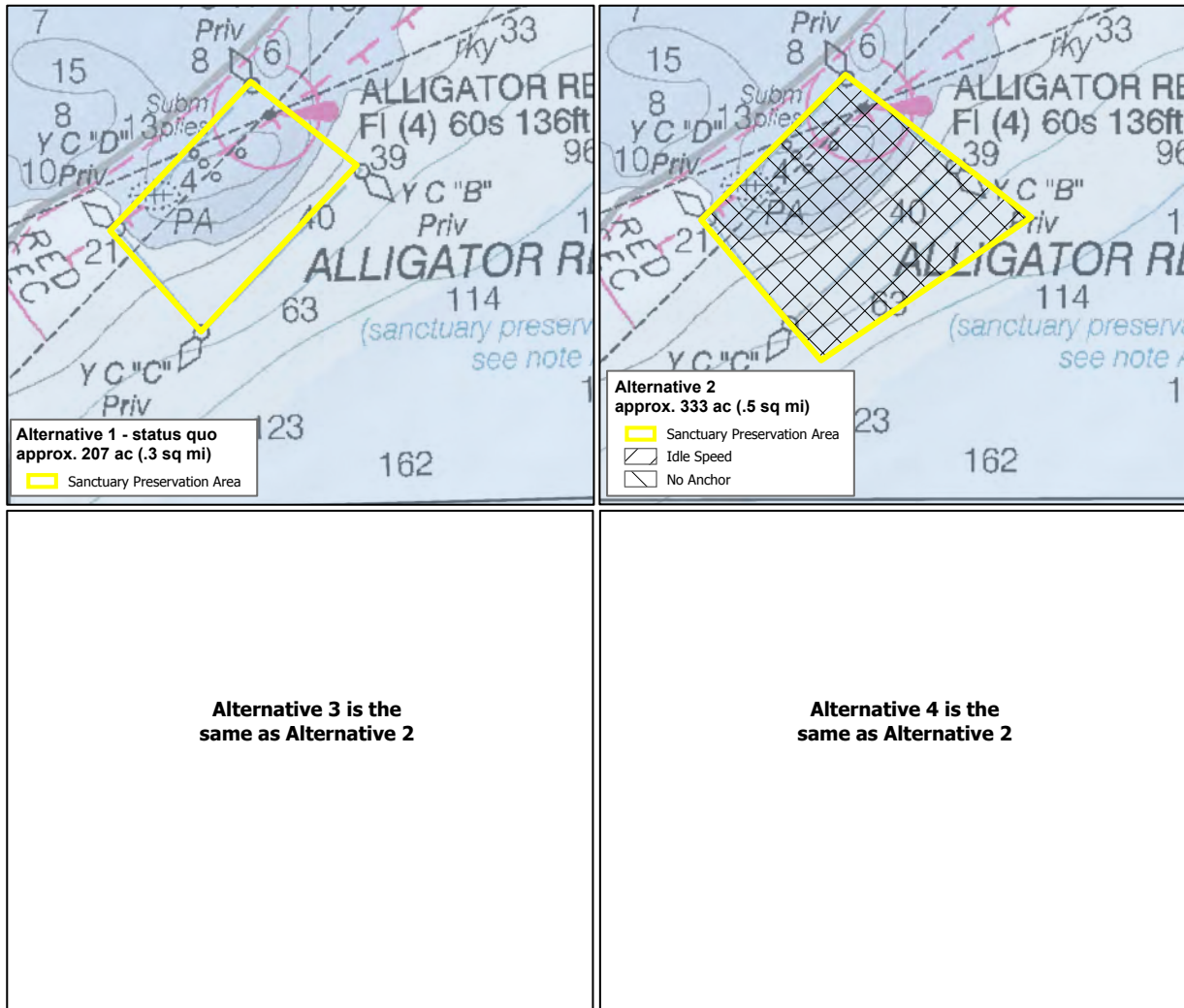
Decreases disturbance of brown pelican and magnificent frigatebird roosting areas in Lignumvitae Key Aquatic Preserve and Lignumvitae Key Botanical State Park. This area receives high concentrations of boating and fishing pressure with impacts to birds from fishing line and hooks. Shallow seagrass flats around the island exhibit light-to-major prop scarring.



Middle Keys Region



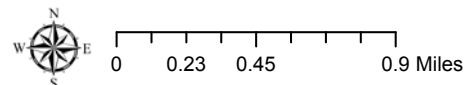
This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.



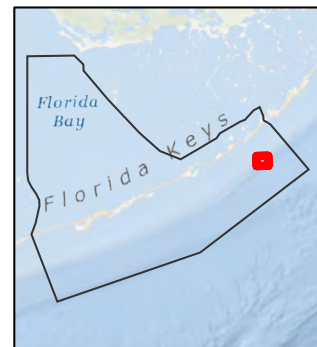
Alligator Reef Sanctuary Preservation Area

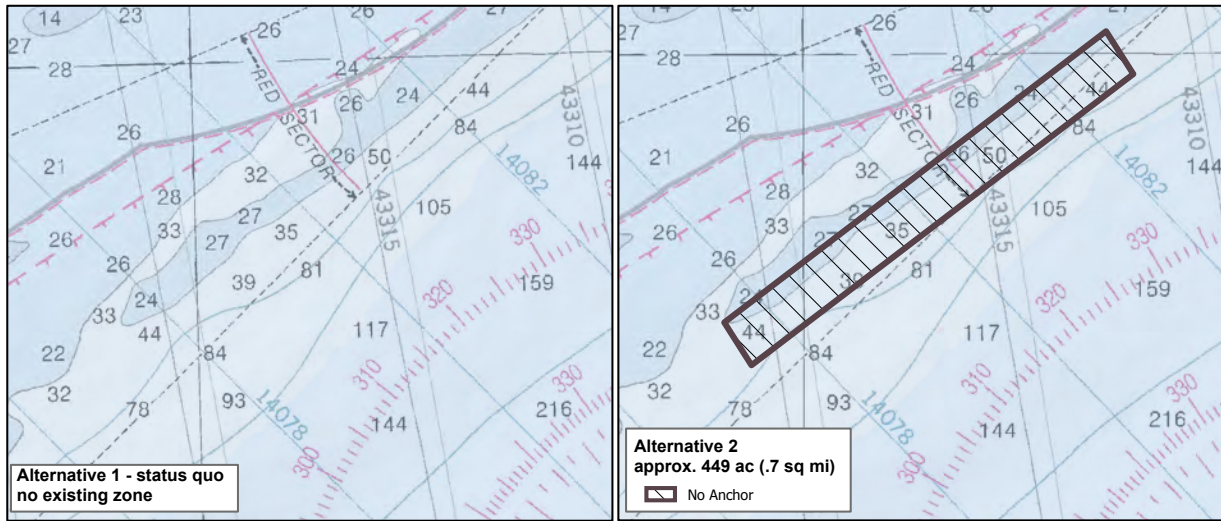
Protects a low-relief, drowned spur-and-groove bank reef system that marks a geological transition between shallow Upper and Middle Keys reefs. Formerly contained extensive thickets of ESA-listed staghorn corals and queen conch aggregations and is now an important restoration site for these corals. The historic Alligator Reef lighthouse is included in this SPA. This zone was originally designed to limit consumptive activities and separate users engaged in different activities.

This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.



Middle Keys Region



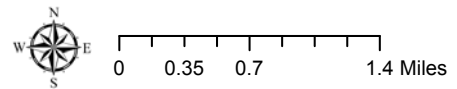


Alternative 3 is the same as Alternative 2

Alternative 4 is the same as Alternative 2

FMP Alligator Reef Wildlife Management Area

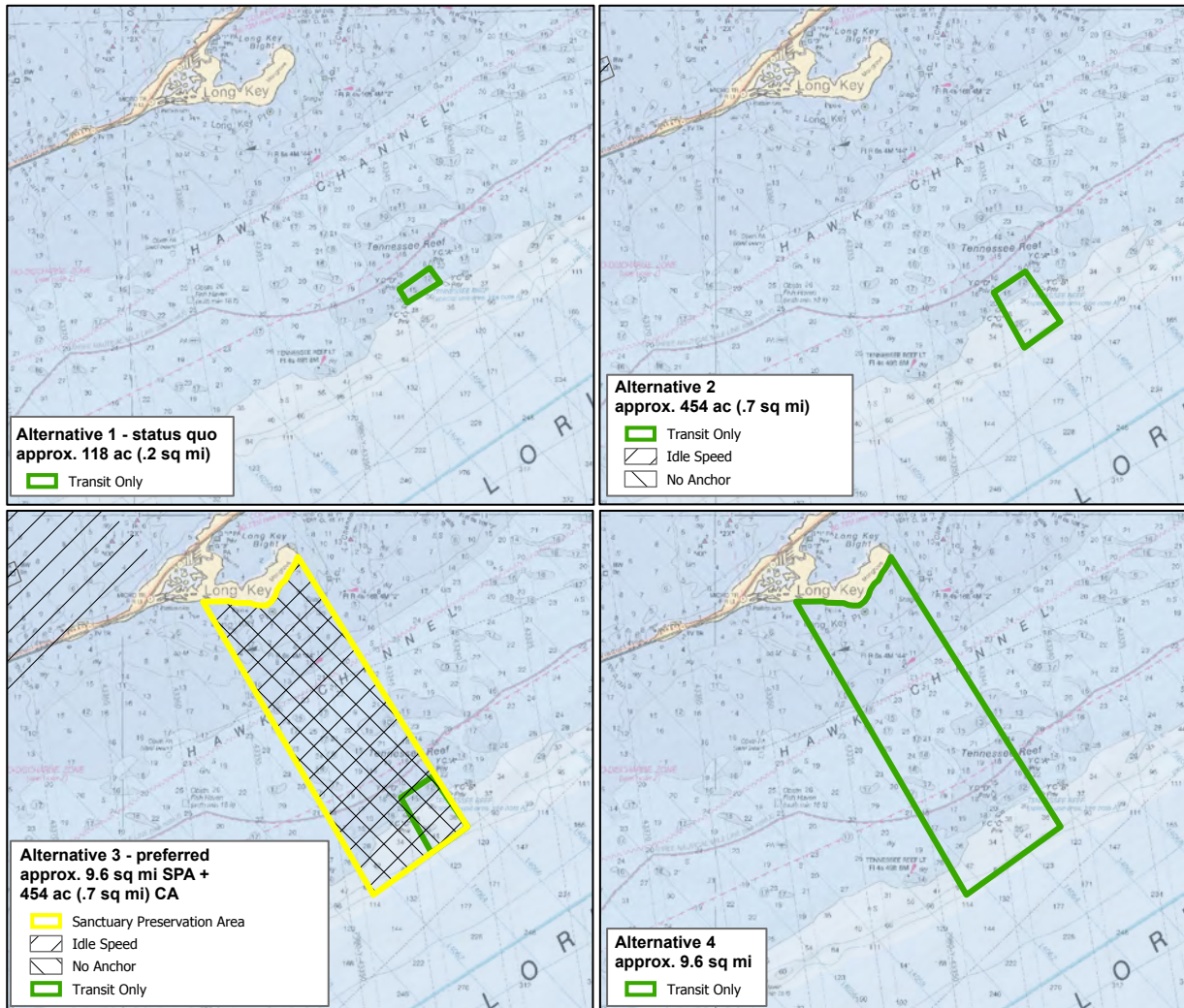
Protects a significant amount of ESA-listed coral by providing additional protections to an existing fishery management plan area closed to lobster trap gear.



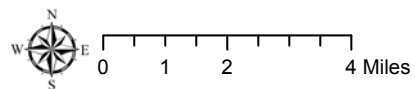
Middle Keys Region



This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.



Tennessee Reef Special Use Area/Conservation Area or Long Key Tennessee Reef Sanctuary Preservation Area/Conservation Area

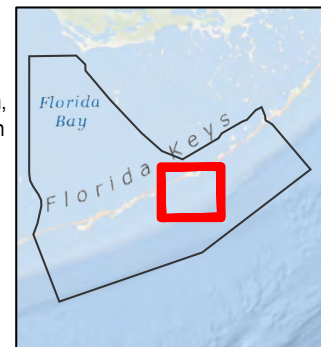


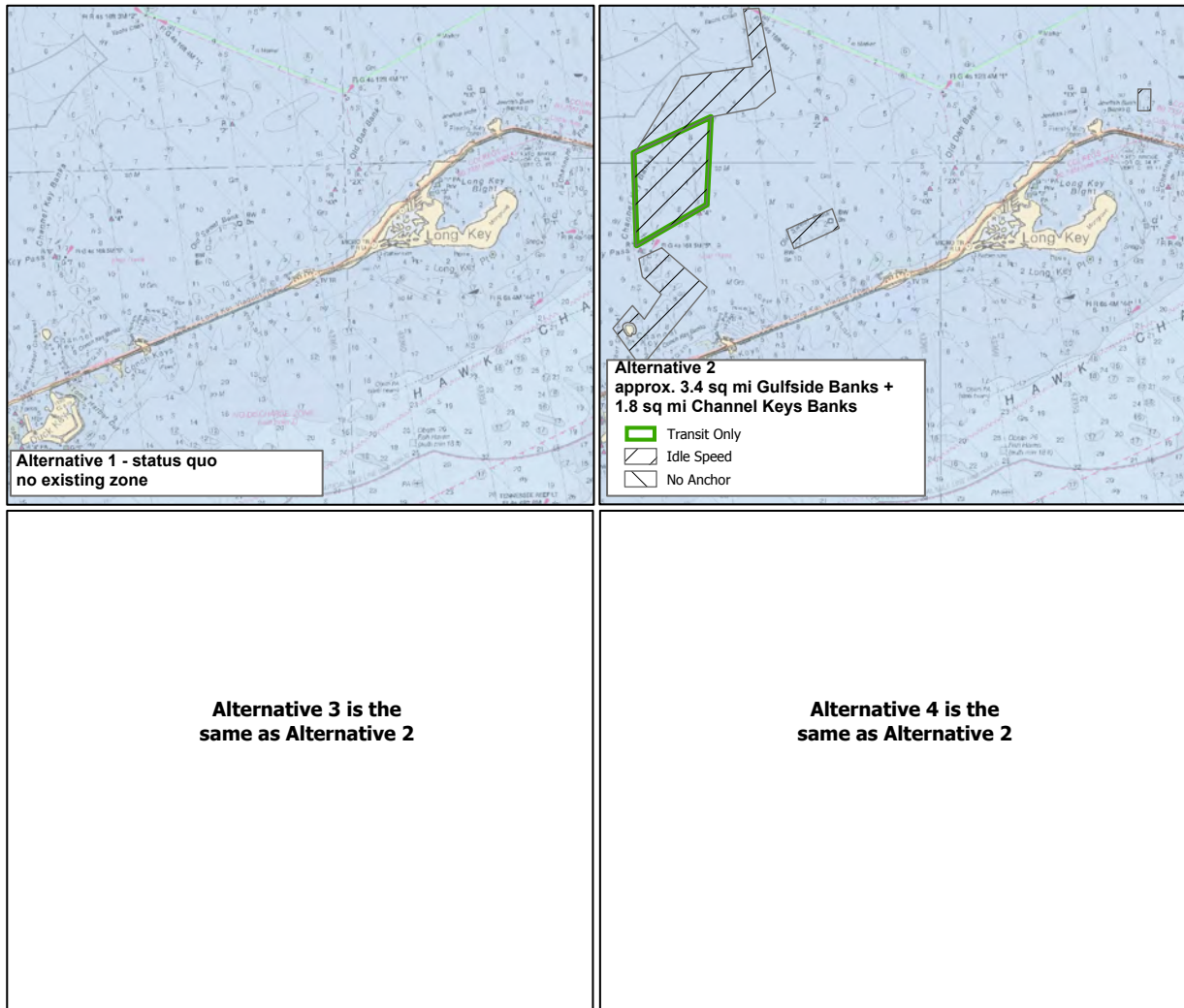
Tennessee Reef SUA/CA protects a deep, drowned spur-and-groove reef with unique deep-water, slow growing corals and sponges. Historically supported large assemblages of ESA-listed staghorn coral and is currently a target for coral restoration as well as an important research site to evaluate changing environmental conditions and impacts of Florida Bay water masses.

Long Key Tennessee Reef SPA/CA protects large, contiguous, interconnected seagrass, shallow hardbottom, aggregate patch reef, and deep, drowned spur-and-groove reef habitats, and provides a corridor for migration of different life stages of fishes from Florida Bay into the Middle Keys. Supports unique deep water, slow growing corals and sponges and remnant populations of ESA-listed staghorn corals. Builds on an existing Tennessee Reef SUA and encompasses an important site for resilience, research, and coral restoration. This area is proposed to meet the advisory council goal to protect large, contiguous, diverse, and interconnected habitats, including for fish moving inshore to offshore through their life cycle. This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time.

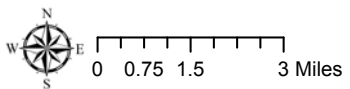
For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

Middle Keys Region





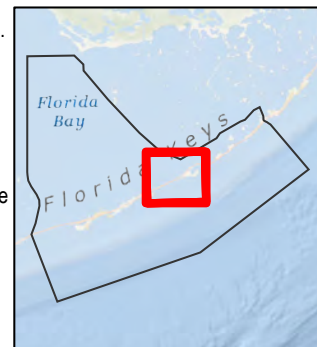
**Channel Key Bank Conservation Area, Gulfside Banks
Channel Key Bank WMA, Gulfside Banks Old Sweat
Bank WMA, Gulfside Banks Jewfish Bush Banks WMA**



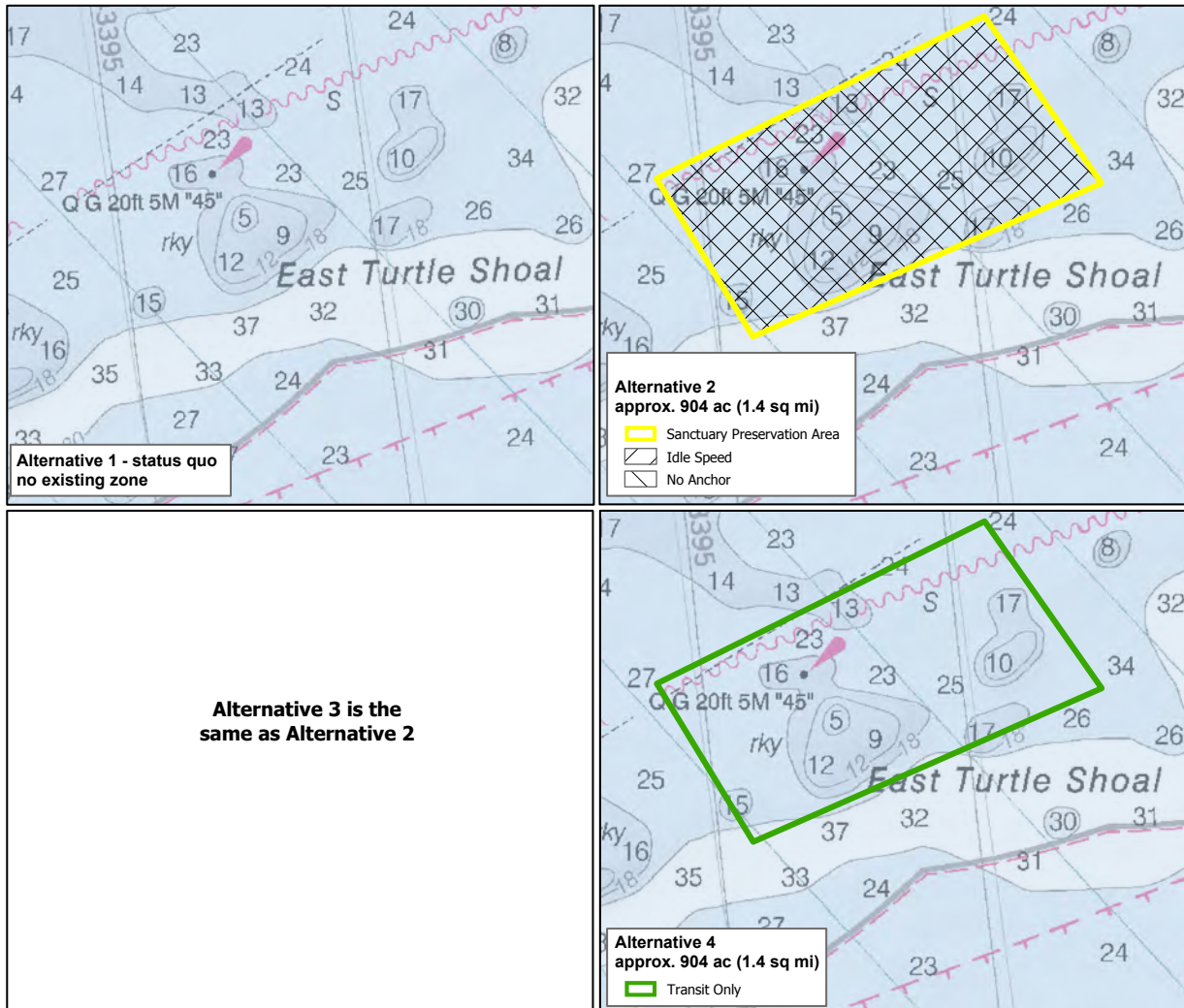
Channel Key Banks CA protects large, contiguous, interconnected, shallow seagrass and hard-bottom habitats that support diverse sponge assemblages, queen conch, reticulated sea star, and coral populations. Habitats connect juvenile fish populations with their offshore reef-associated cohorts. An underrepresented habitat type within FKNMS that separates Florida Bay waters from the open ocean, but is very shallow in places and protection will reduce the occurrence of prop scarring and other boat induced injuries.

The Gulfside Banks WMA protect seagrass and hardbottom bank habitat type that support many juvenile fish species prior to their movement to the coral reef. This habitat type is not currently well represented in the existing FKNMS marine zones. The banks and associated channels are difficult to locate, are susceptible to boat groundings, and the majority of the banks have light prop scarring.

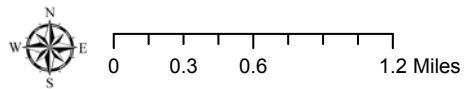
Middle Keys Region



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Turtle Shoal Sanctuary Preservation Area or Conservation Area

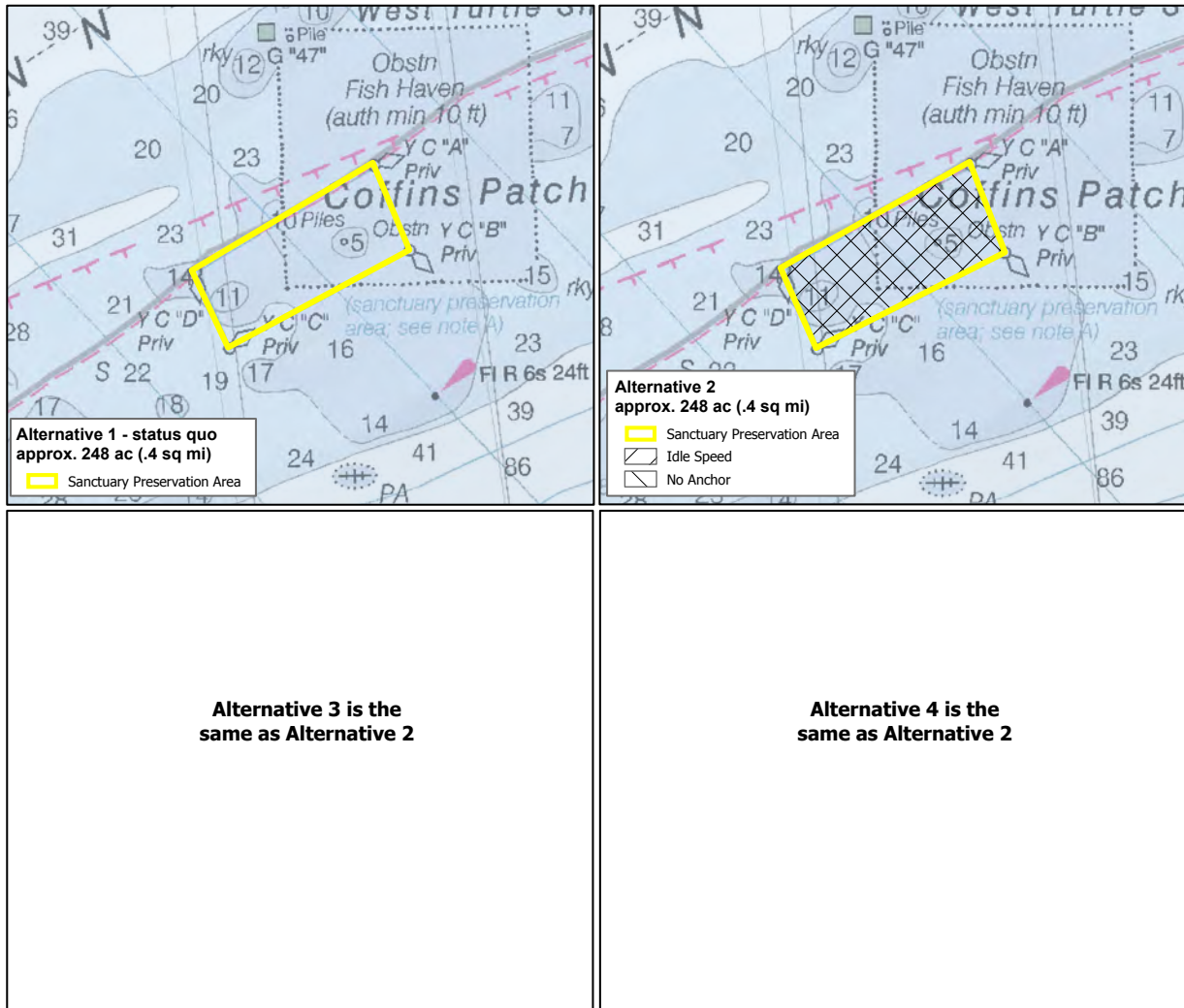


Protects an important complex of mid-channel aggregate and individual patch reefs surrounded by seagrass beds that historically supported large populations of ESA-listed staghorn and pillar corals. This area includes high stony coral cover, resilient reefs, and high fish diversity.

Middle Keys Region



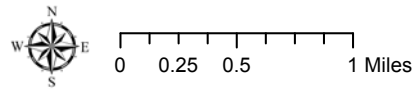
This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.



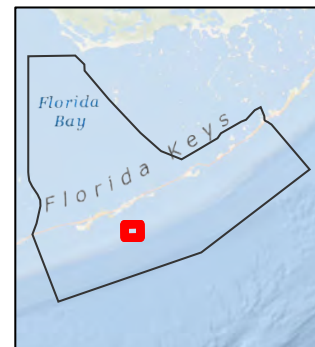
Coffins Patch Sanctuary Preservation Area

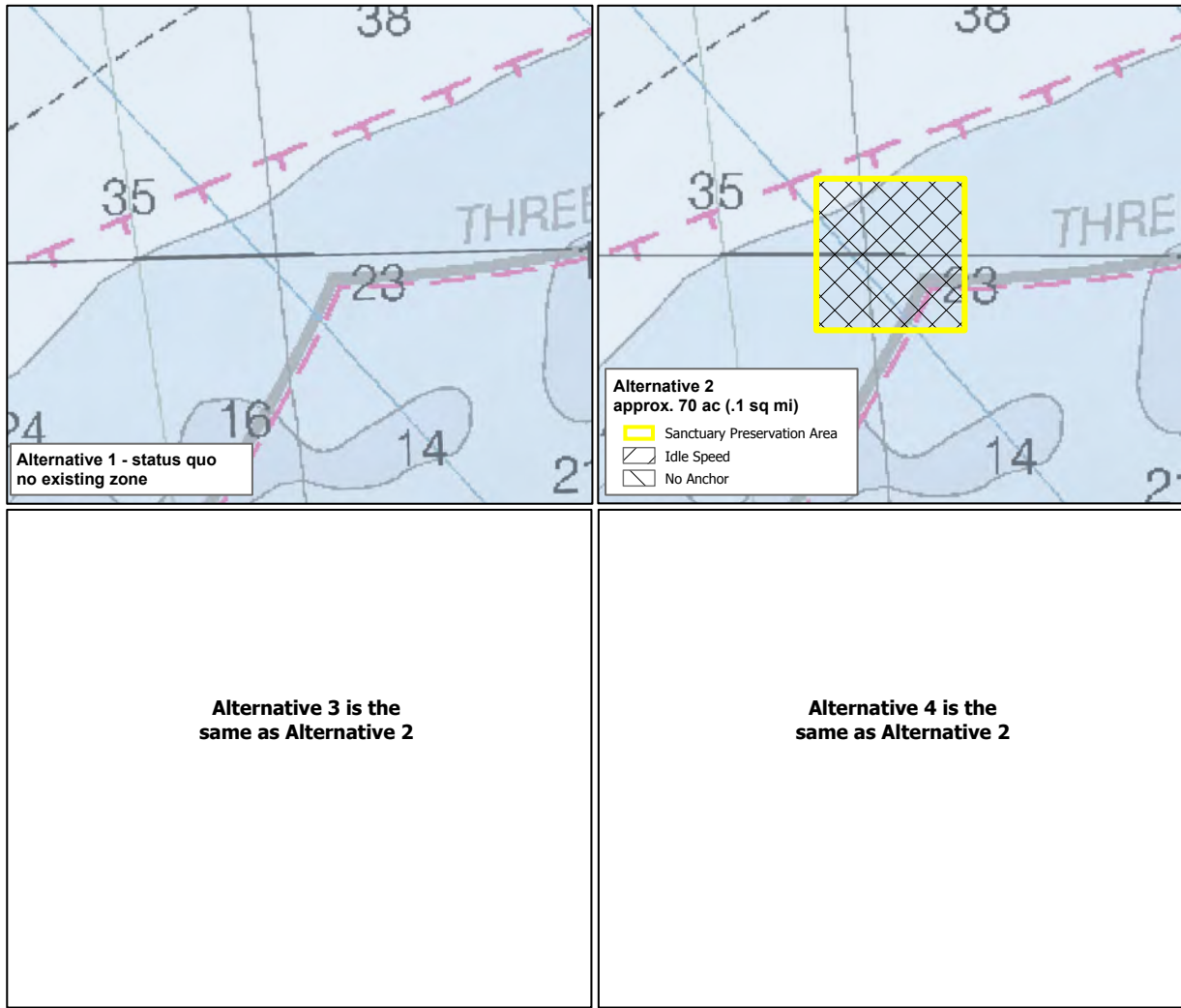
Protects a tiered aggregate reef system with limited spur-and-groove development and one of the most prominent reef wall systems in the Florida Keys with some of the largest historic populations of ESA-listed staghorn, elkhorn, and pillar corals. This zone was originally designed to limit consumptive activities and separate users engaged in different activities.

This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.



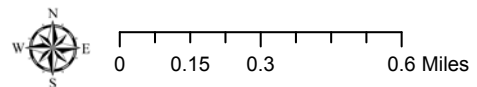
Middle Keys Region





**Marathon Key
Sanctuary Preservation Area**

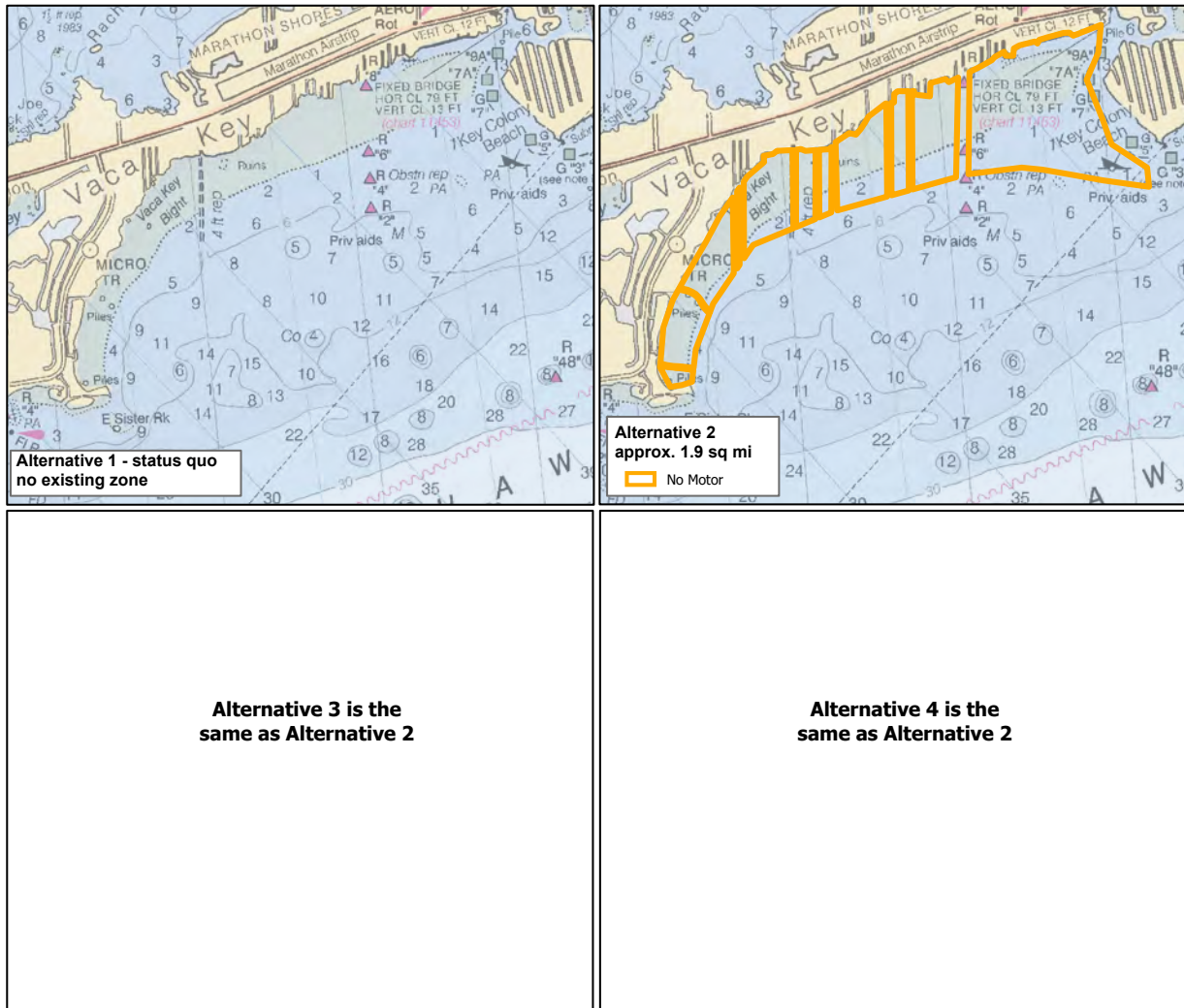
Protects an important coral nursery area within the Middle Keys and provides an area for restoration of degraded coral reef ecosystem sanctuary resources.



Middle Keys Region

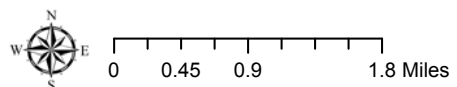


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Marathon Oceanside Shoreline Wildlife Management Area

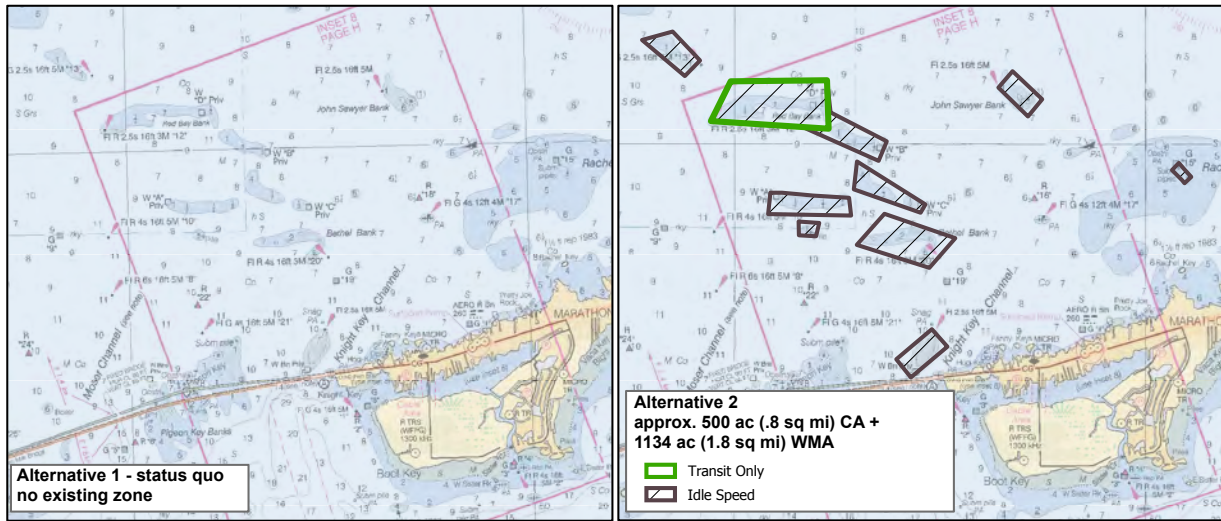
Decreases disturbance to nearshore seagrass and hardbottom habitats from vessel impacts. The area along Vaca Cut is impacted by numerous vessel groundings and has severe prop scarring. The remaining area along the Marathon shoreline has light prop scarring and areas oceanside of Boot Key have moderate-to-severe prop scarring.



Middle Keys Region



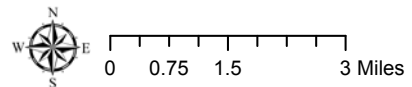
This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.



Alternative 3 is the same as Alternative 2

Alternative 4 is the same as Alternative 3

Moser Channel Banks Wildlife Management Areas and Red Bay Banks Conservation Area

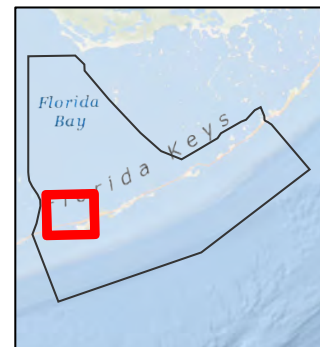


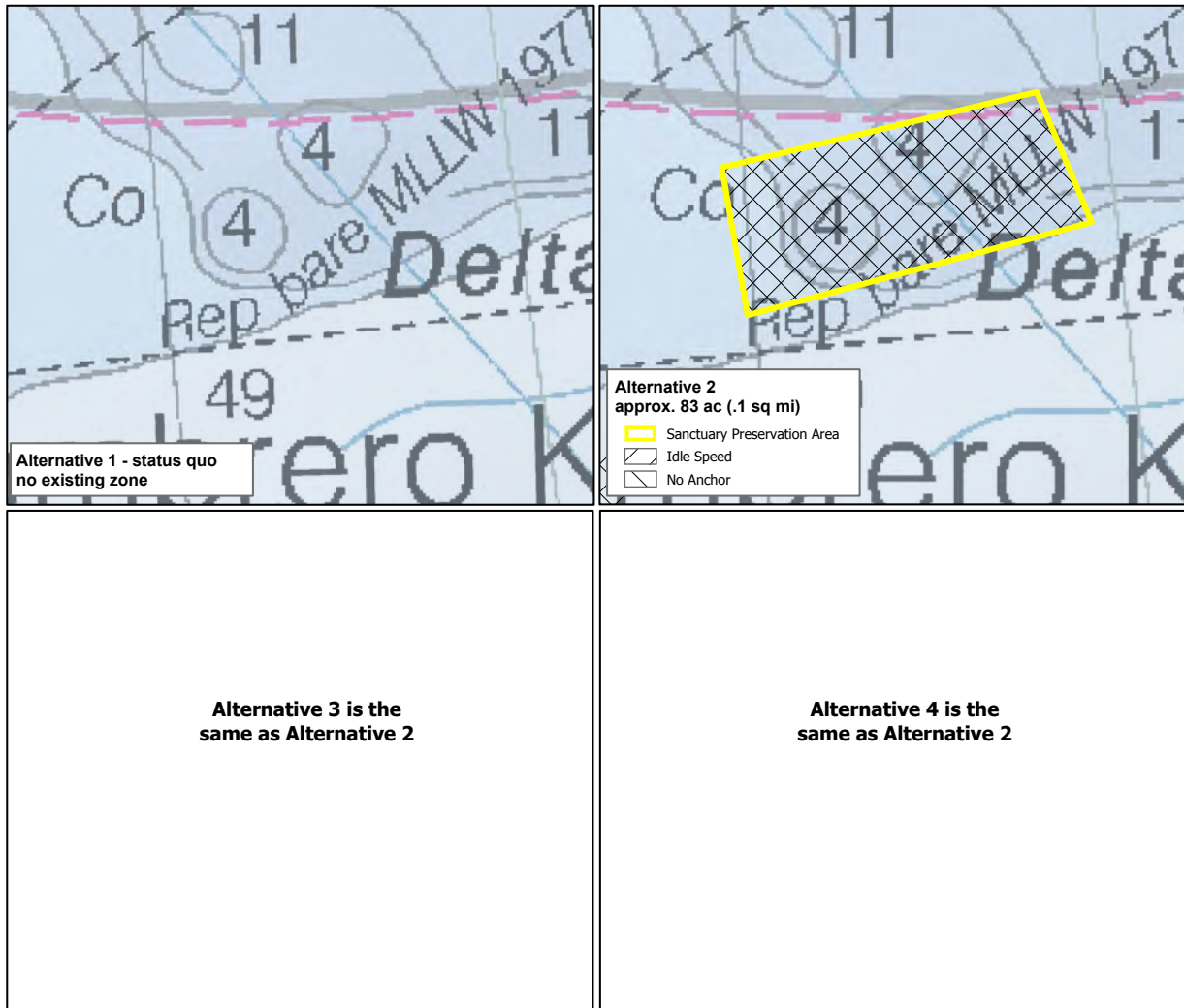
Moser Channel Banks WMAs protect seagrass and hardbottom habitat that support a diverse assemblage of corals, sponges, macroalgae, and seagrasses. Decreases disturbance to these benthic habitats from vessel impacts. The majority of the banks have moderate prop scarring. This habitat type is not currently well represented in the existing FKNMS marine zones.

Red Bay Bank CA protects large, contiguous, interconnected, shallow seagrass and hardbottom habitats that support diverse sponge assemblages, queen conch and reticulated sea star populations, along with rose coral, finger coral, ivory bush coral, and other corals that are not usually seen on reefs. Habitats connect juvenile fish populations with their offshore reef-associated cohorts. Includes many shallow areas that have been impacted by prop scarring and other boat injuries. Protection will reduce the occurrence of prop scarring and other boat-induced injuries.

This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

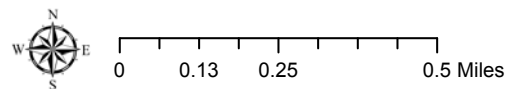
Middle Keys Region





Delta Shoal Sanctuary Preservation Area

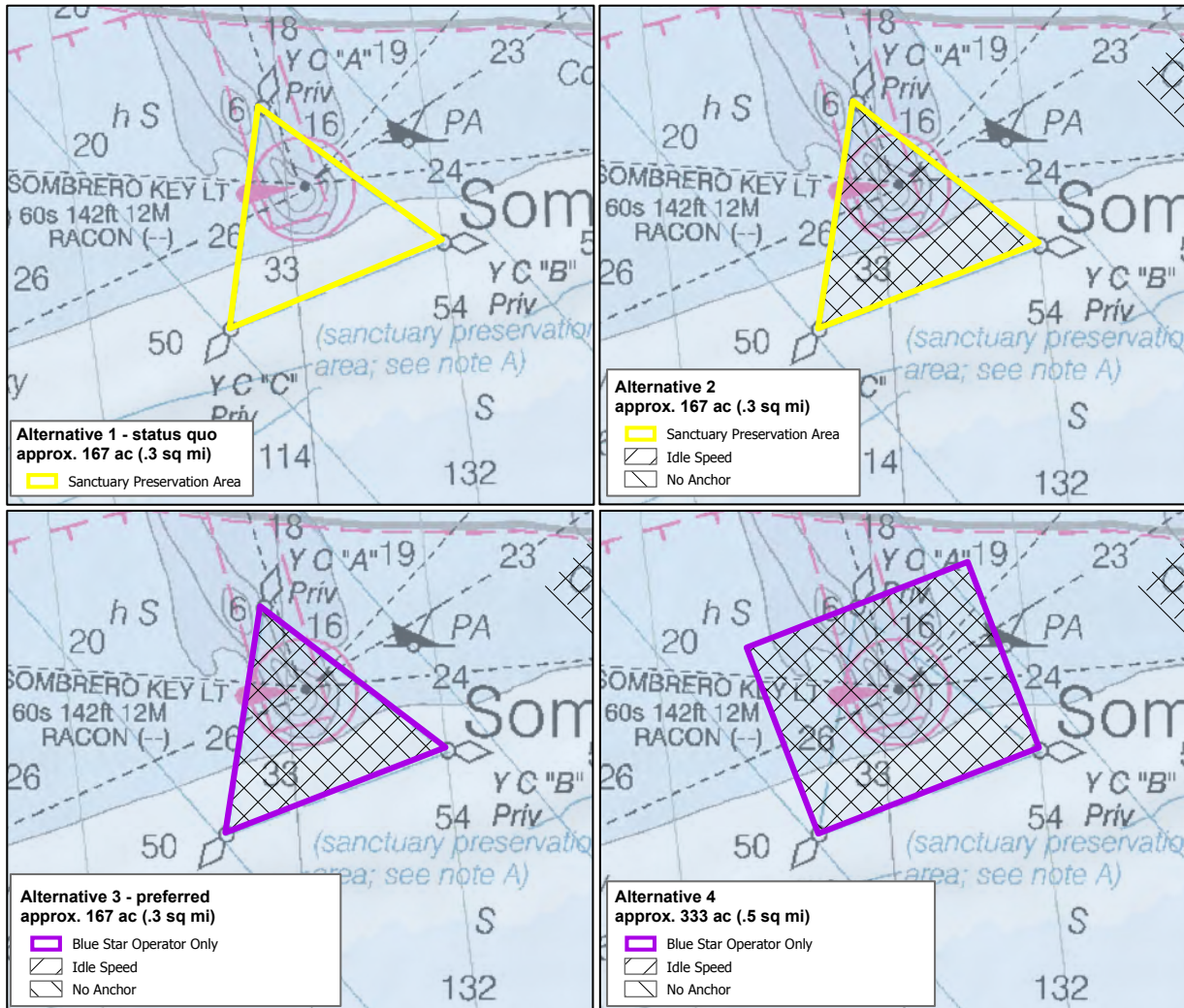
Protects a spur-and-groove fore reef, with a prominent rubble berm back reef, that drops off to a well-developed, intermediate, drowned spur-and-groove reef. This area is provided for restoration of degraded coral reef ecosystem sanctuary resources.



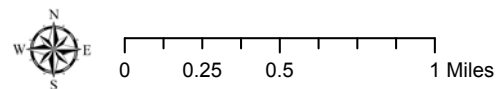
Middle Keys Region



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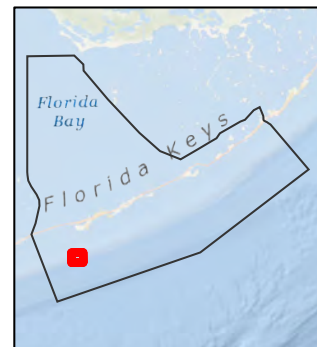


Sombrero Key Sanctuary Preservation Area



Protects the most extensive spur-and-groove and deep fore reef community within the Middle Keys with a high abundance of ESA-listed star corals and an important site for diverse coral assemblages such as brain and other boulder coral species and barrel sponges. The historic Sombrero Key lighthouse is included in this SPA. This zone was originally designed to limit consumptive activities and separate users engaged in different activities.

Middle Keys Region

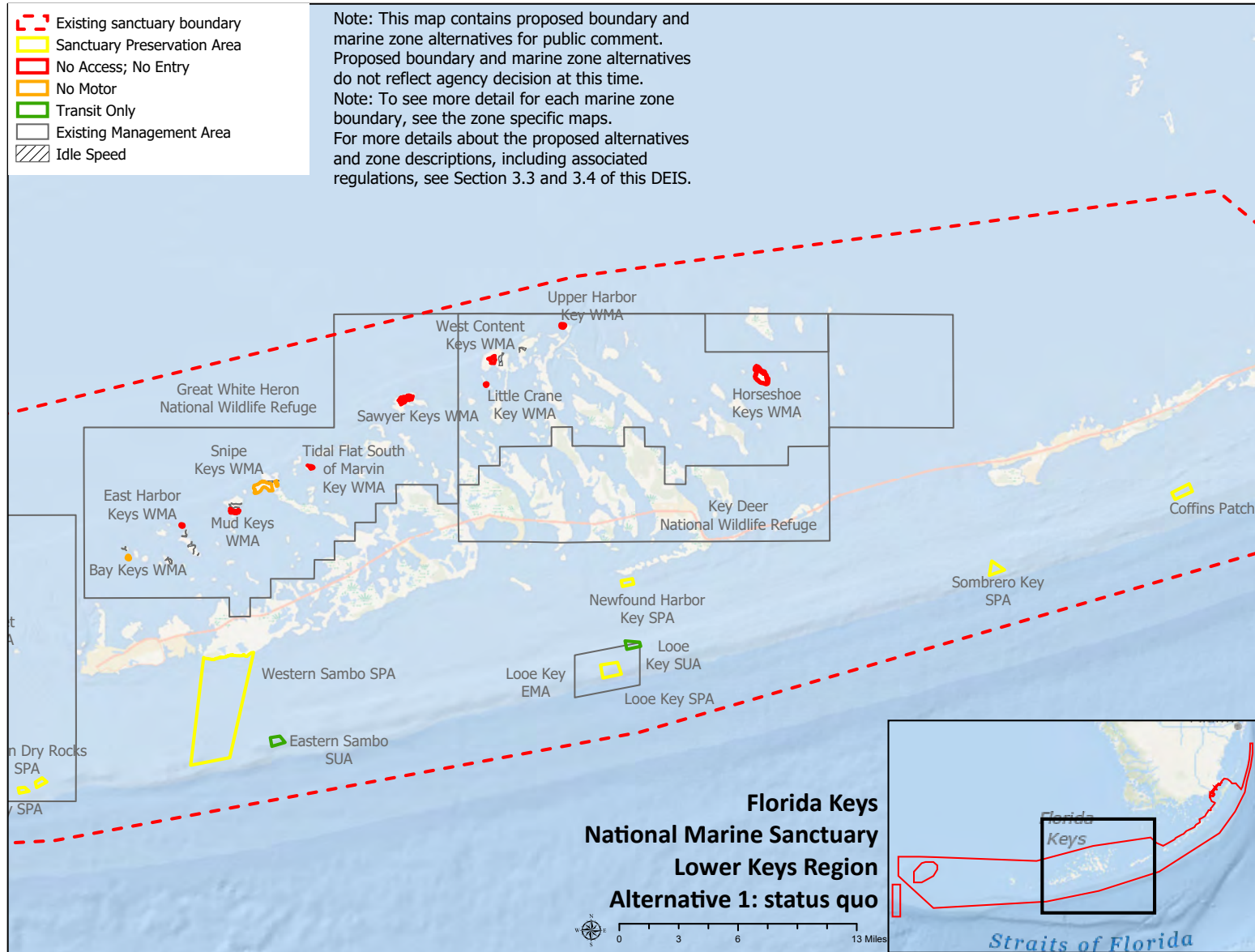


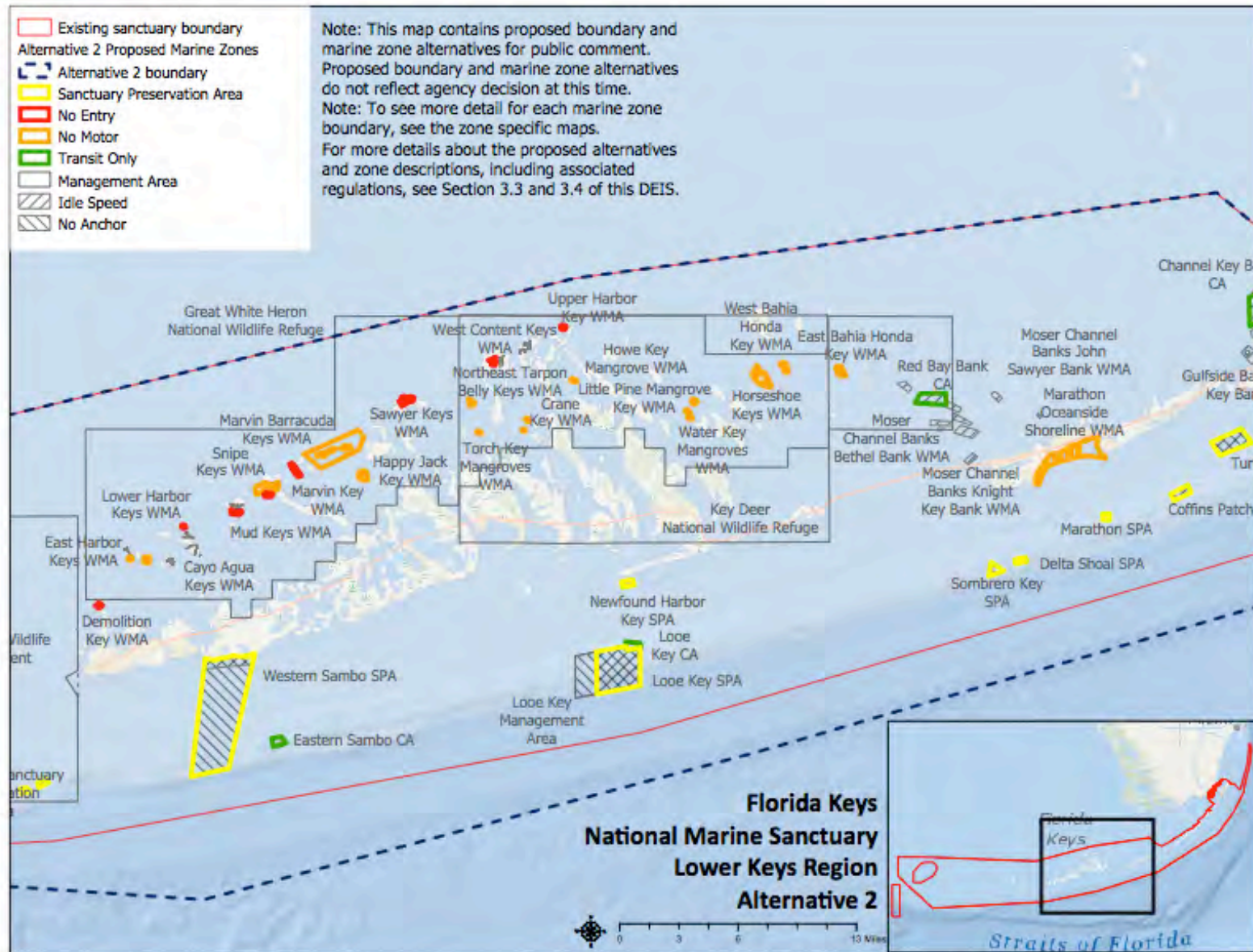
This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

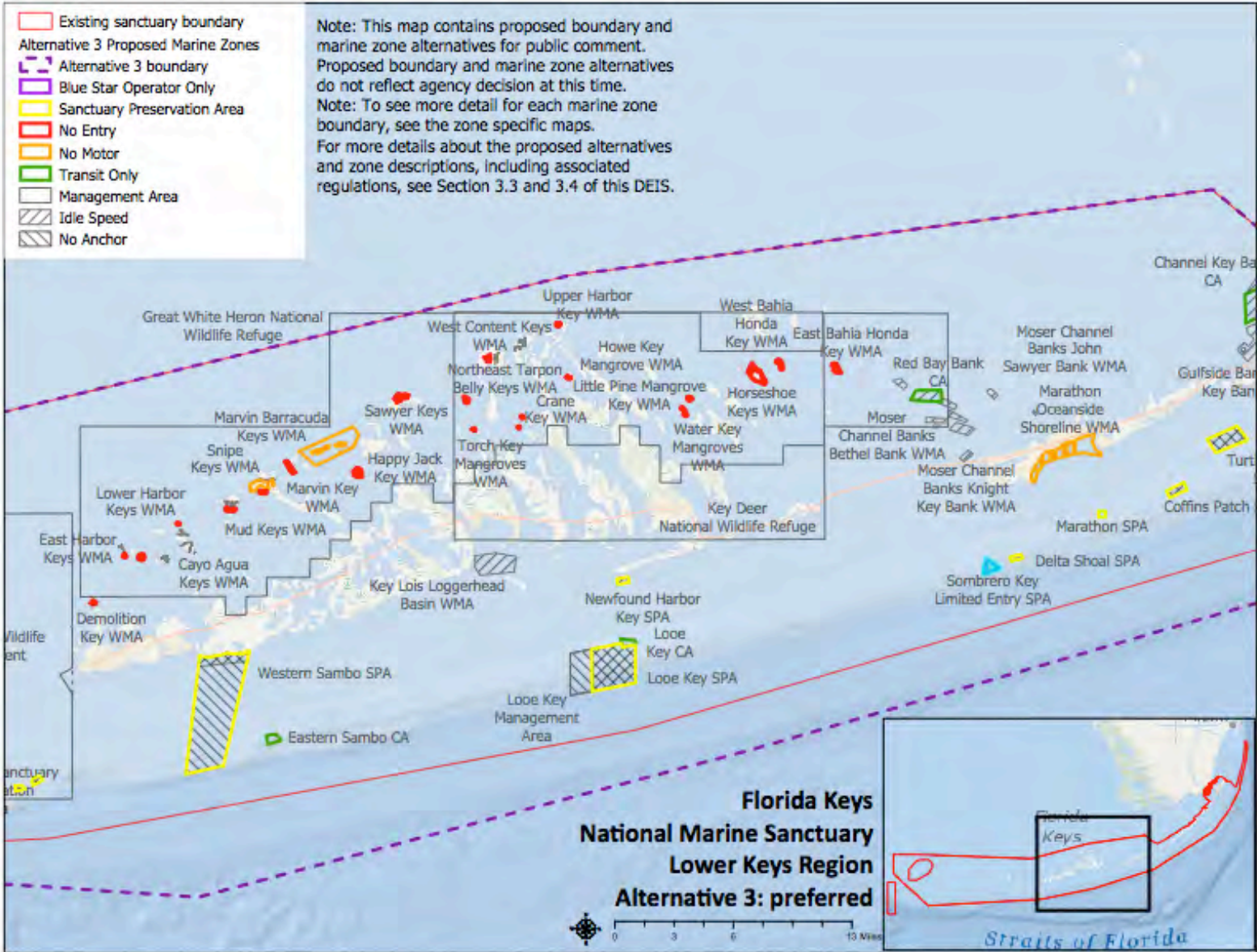
3.6.4 Lower Keys Region and Lower Keys marine zone alternatives

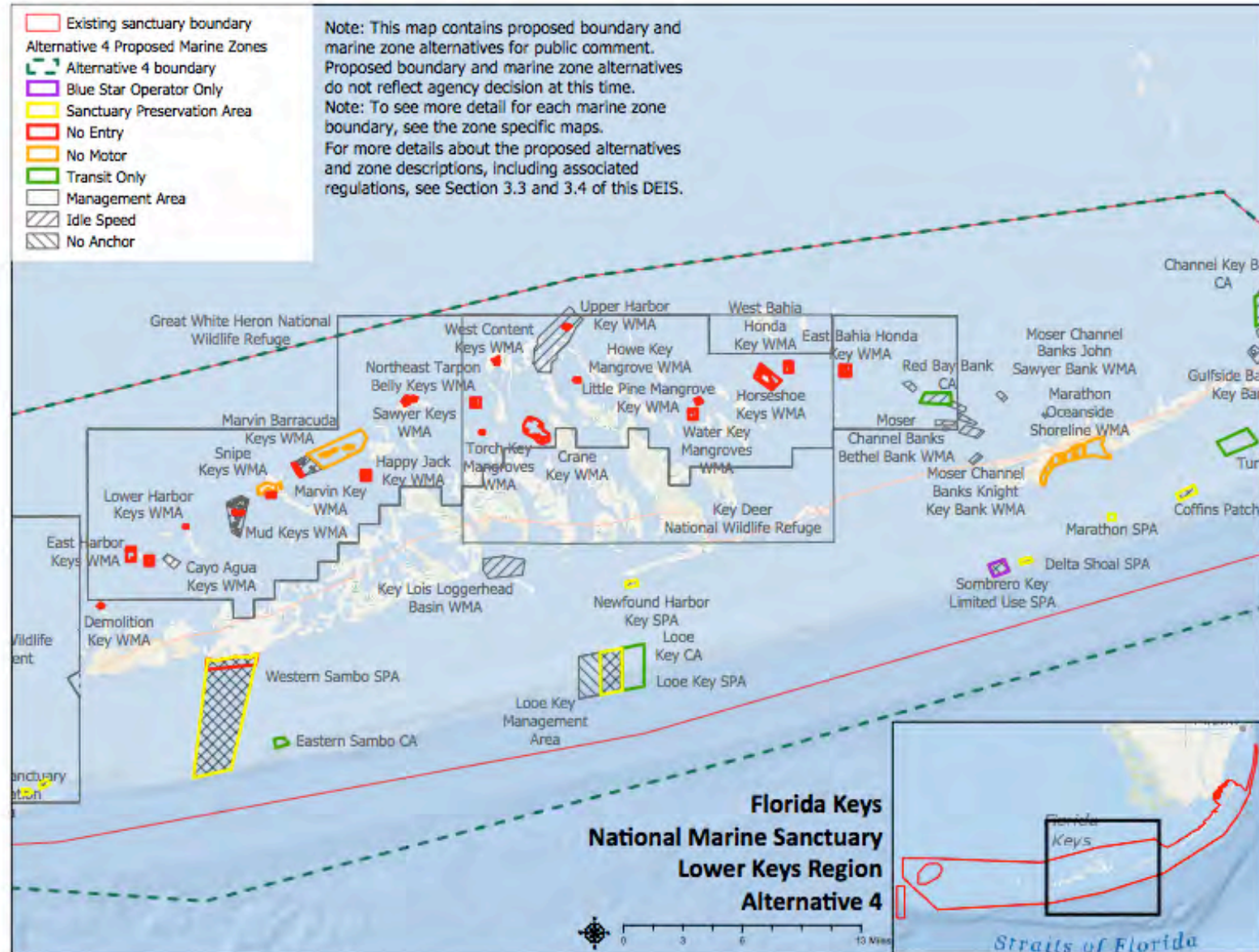


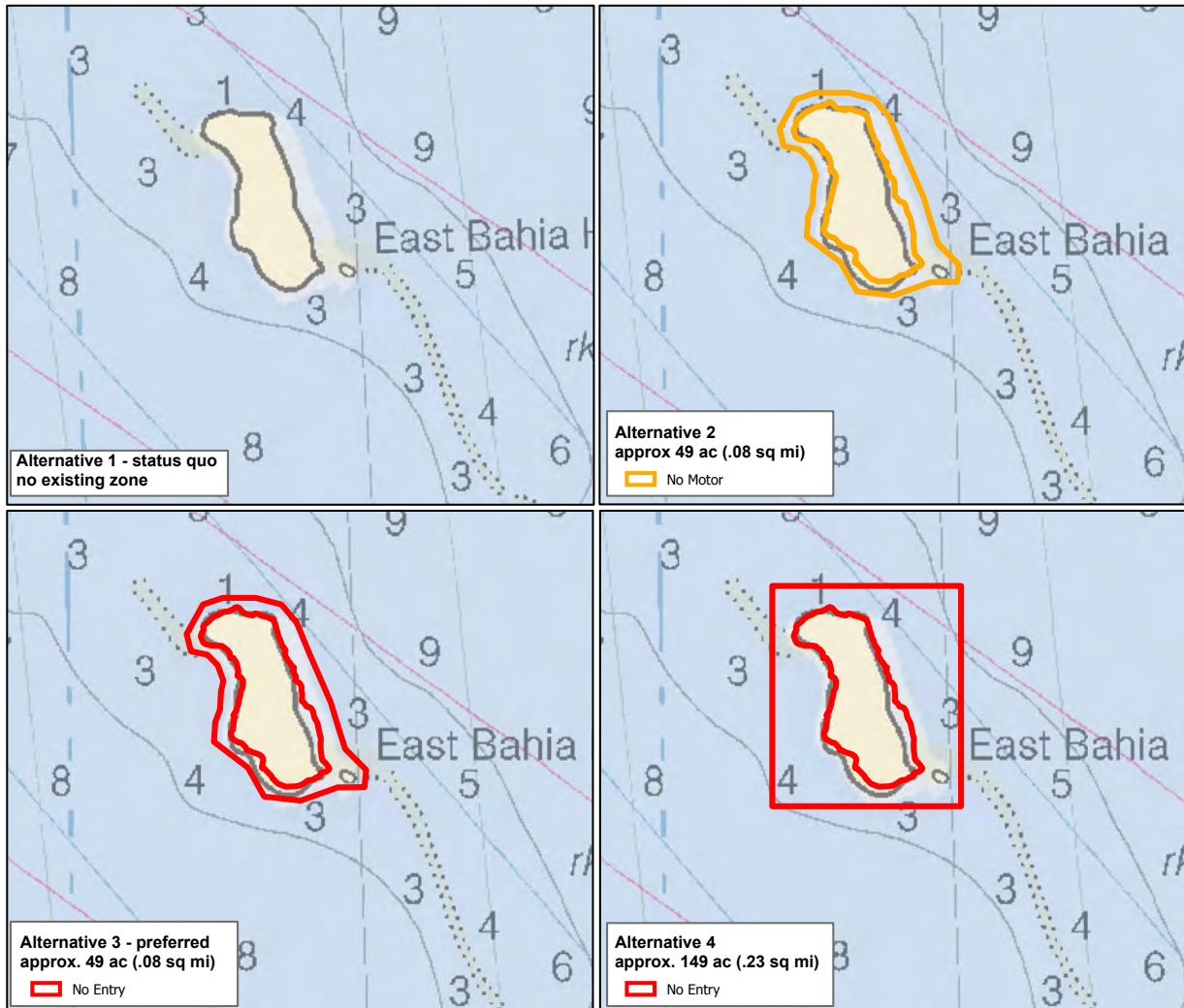
Looe Key, a popular dive and snorkel site in the Lower Florida Keys, was designated a national marine sanctuary in 1981, and incorporated into Florida Keys National Marine Sanctuary in 1990. Photo: Shawn Verne





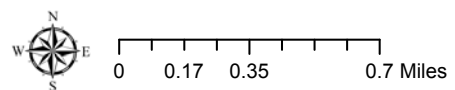




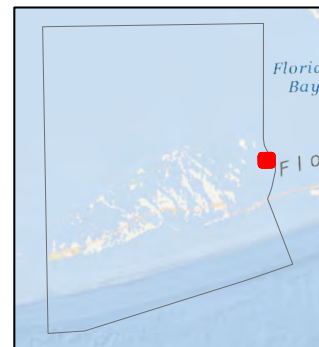


East Bahia Honda Key Wildlife Management Area

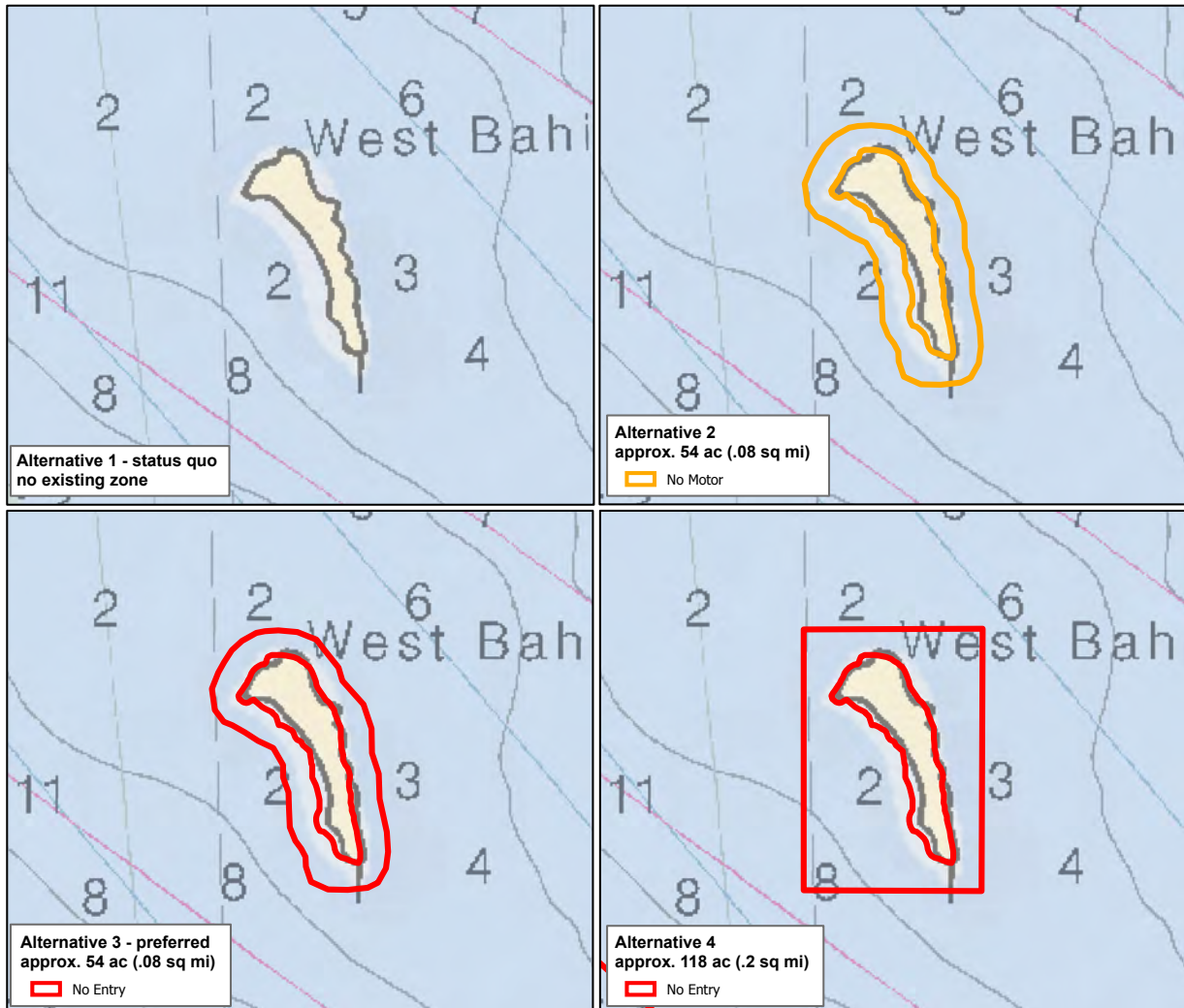
Decreases disturbance of nesting birds including white-crowned pigeon and great white heron.



Lower Keys Region

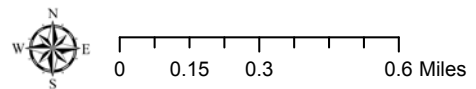


This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

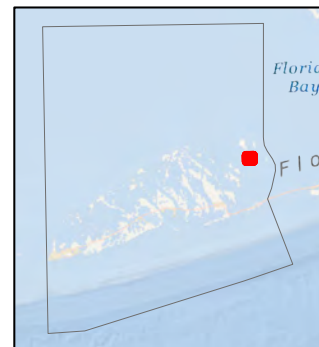


West Bahia Honda Key Wildlife Management Area

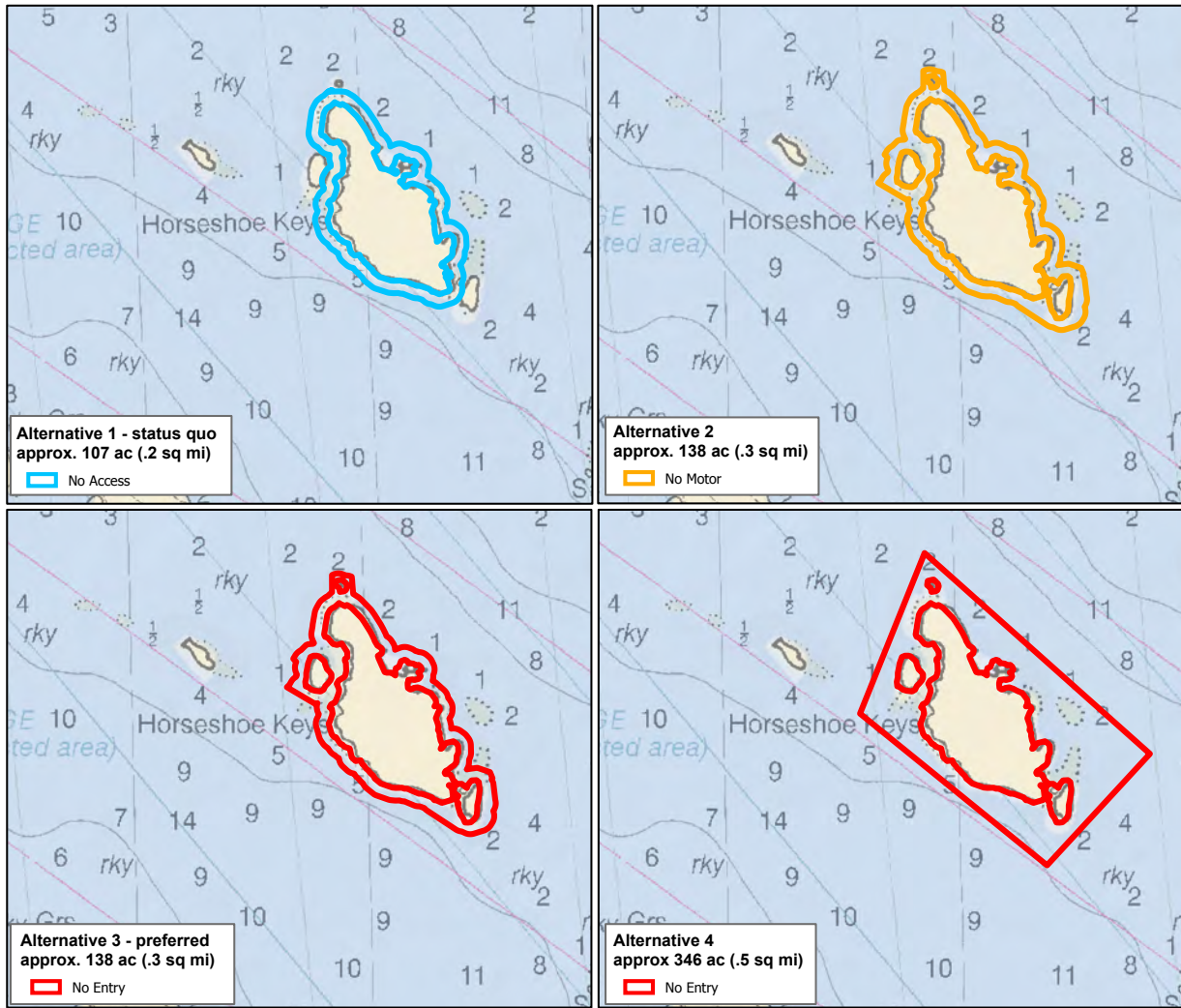
Decreases disturbance of nesting and wading birds including white-crowned pigeons and bald eagles.



Lower Keys Region

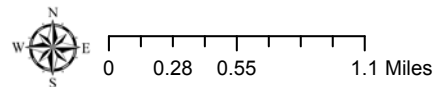


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Horseshoe Key Wildlife Management Area

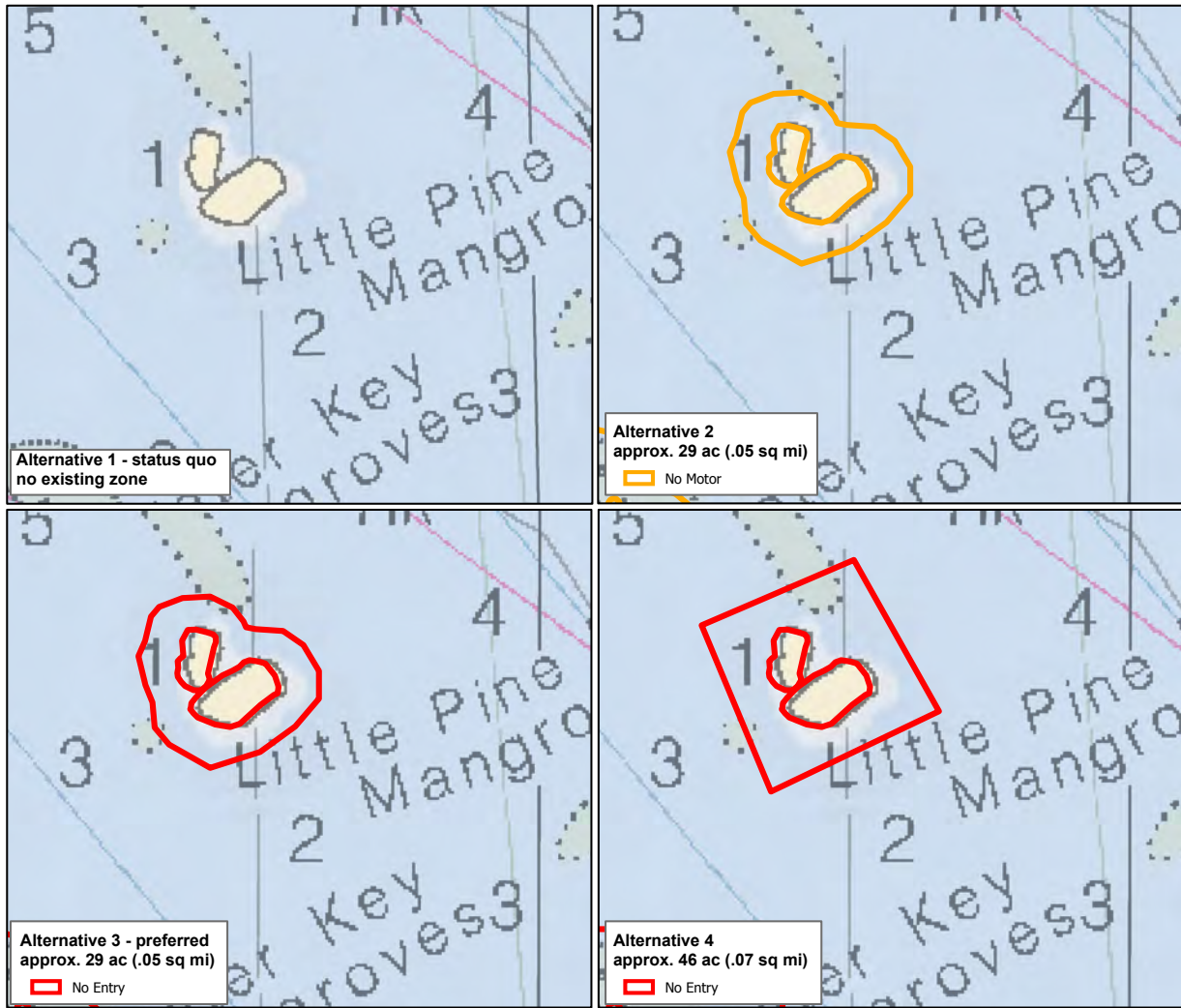
Decreases disturbance of nesting and roosting birds including white-crowned pigeon, great white and little blue herons, willet, and osprey.



Lower Keys Region

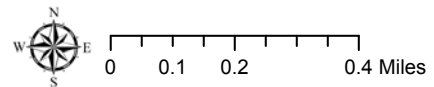


This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

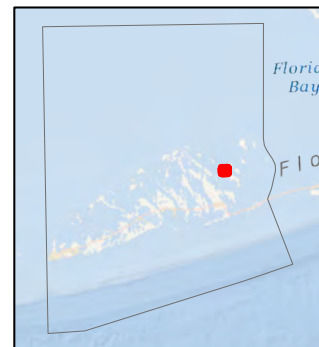


Little Pine Mangrove Key Wildlife Management Area

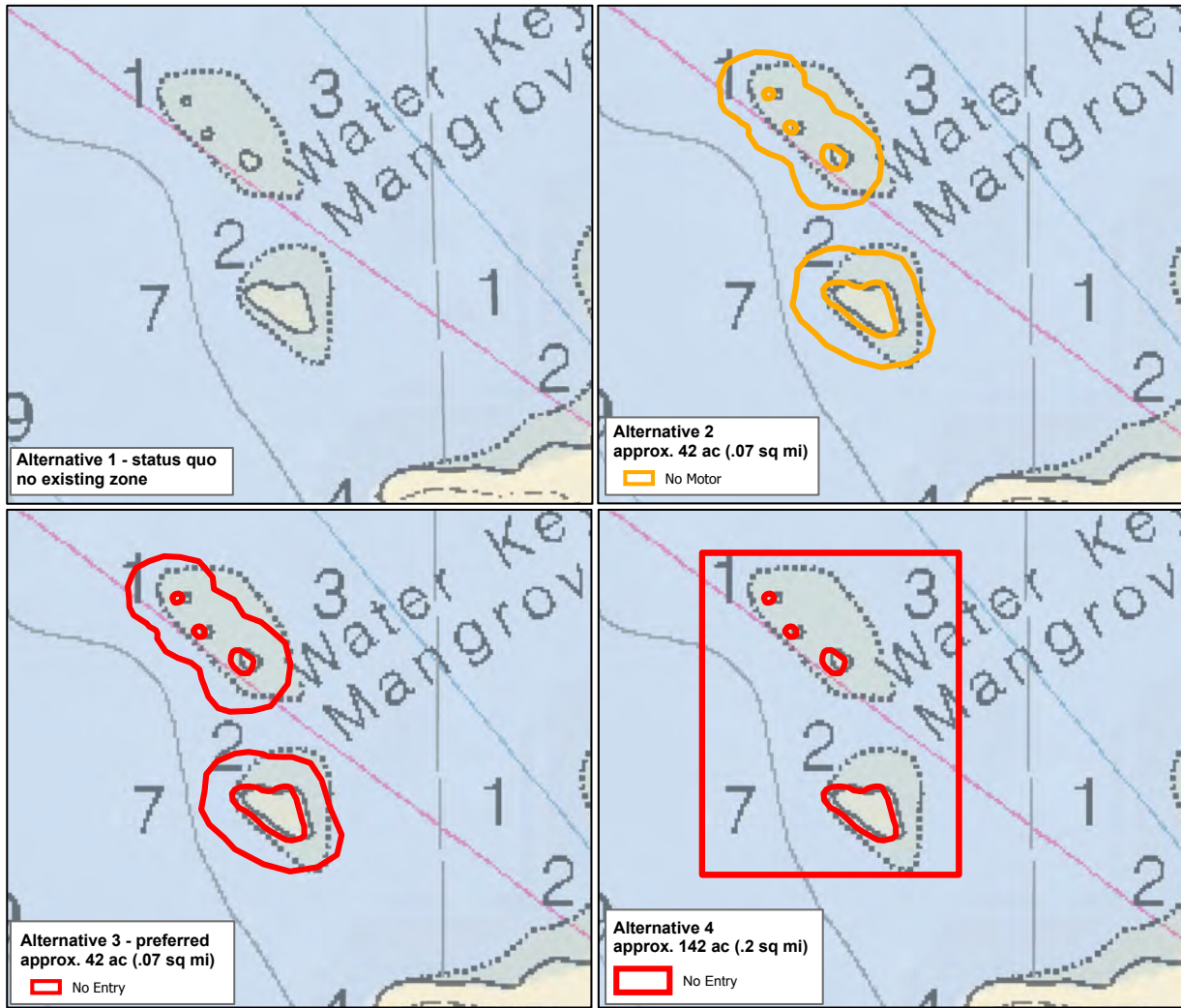
Decreases disturbance of nesting and roosting birds including magnificent frigatebird, reddish egret, and tri-colored and great white herons.



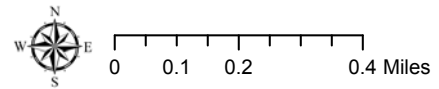
Lower Keys Region



This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

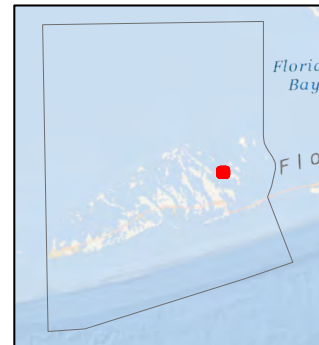


**Water Key Mangroves
Wildlife Management Area**

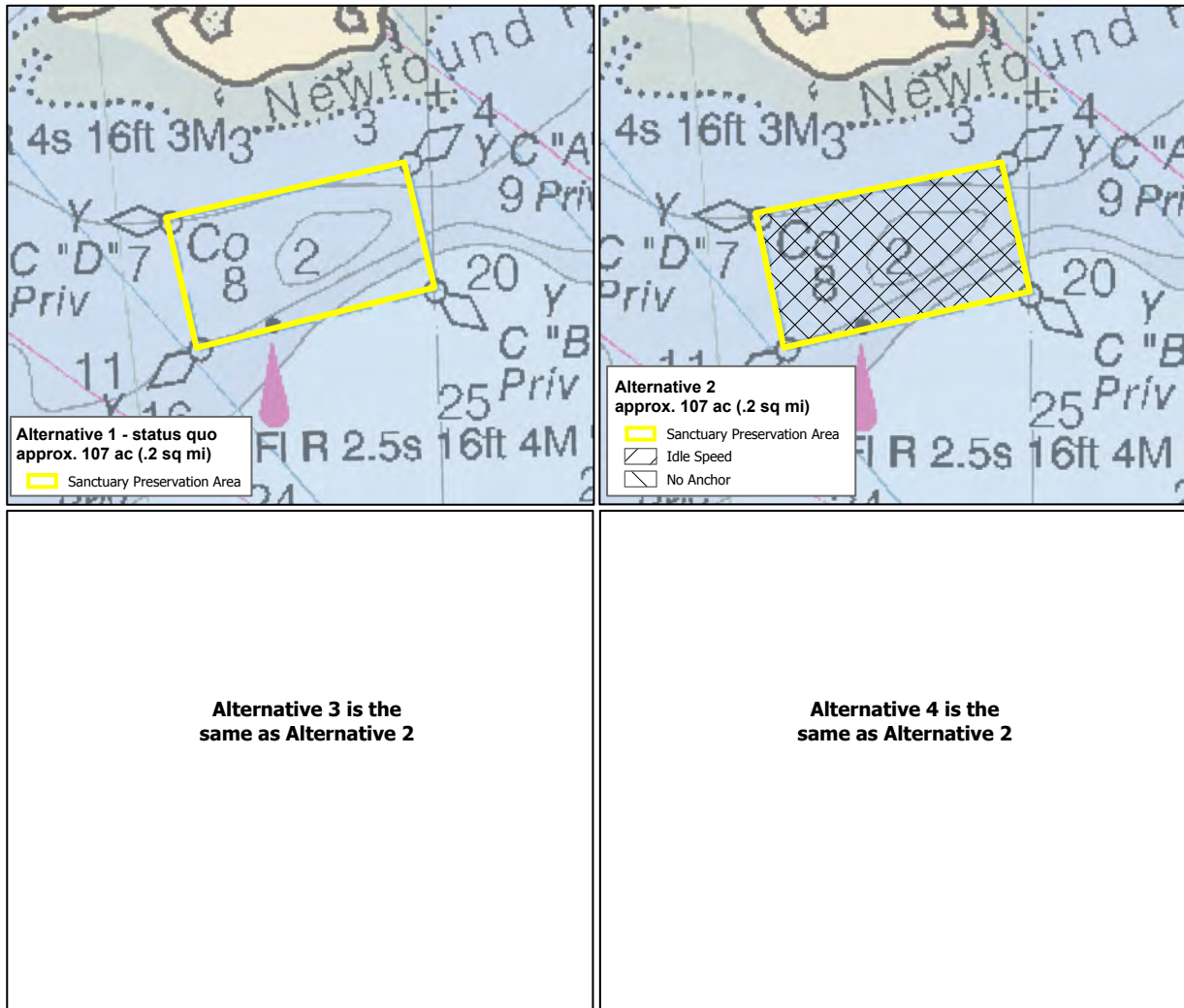


Decreases disturbance of nesting, wading, and foraging birds including reddish egret and great white herons. Decreases impact to habitats for shallow water foraging shorebirds.

Lower Keys Region

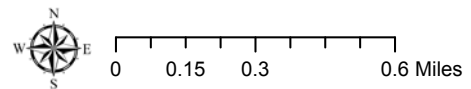


This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

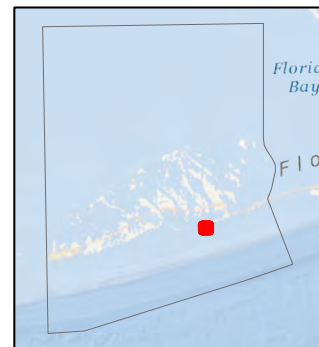


Newfound Harbor Key Sanctuary Preservation Area

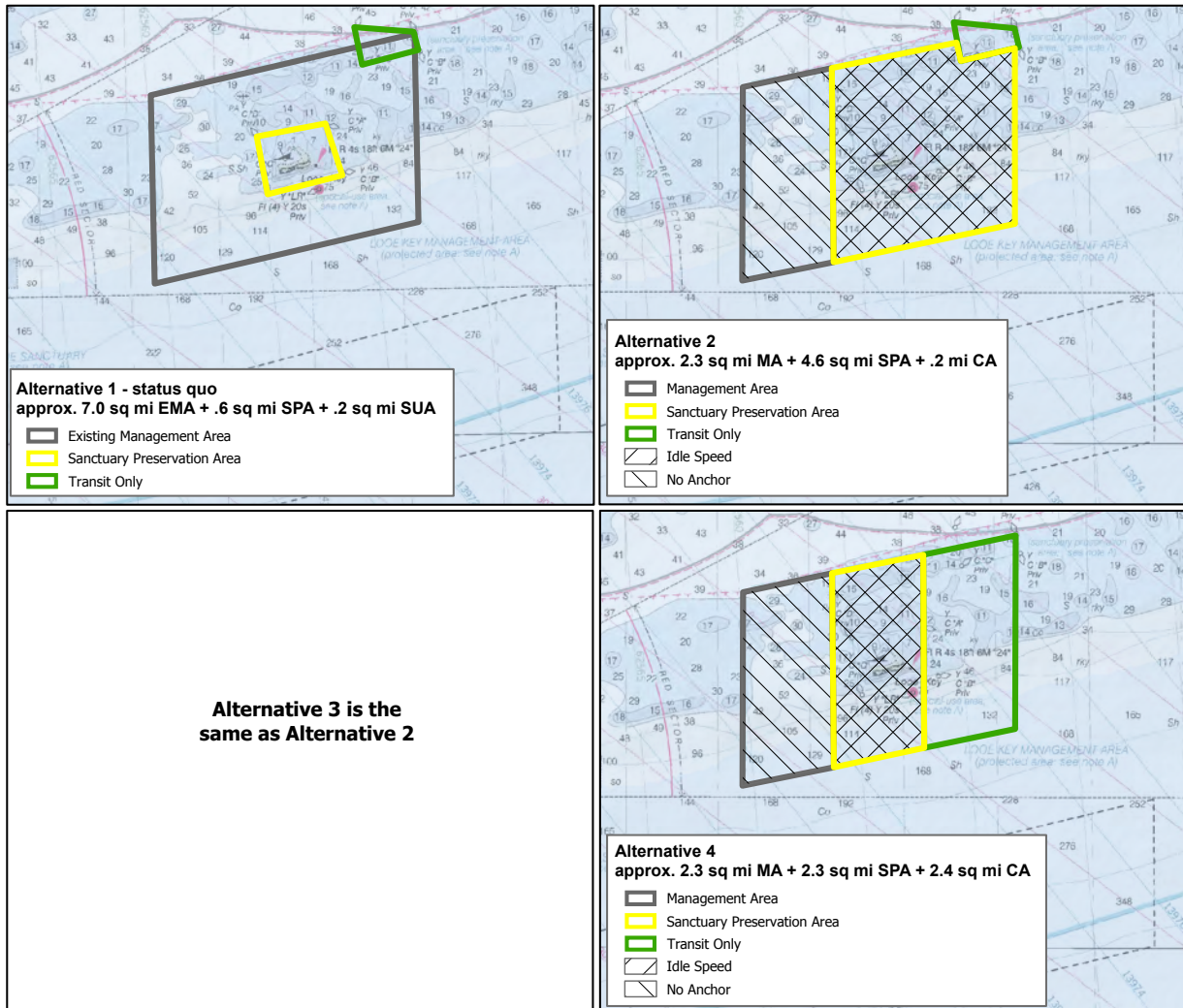
Protects an important, nearshore patch reef community in the Lower Keys near Newfound Harbor that historically supported ESA-listed elkhorn coral, staghorn coral, and mountainous star corals. This site includes coral restoration projects and serves as a site for experiential education. This zone was originally designed to limit consumptive activities and separate users engaged in different activities.



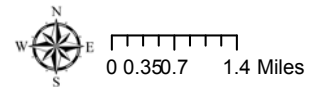
Lower Keys Region



This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

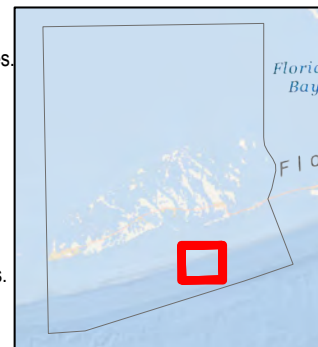


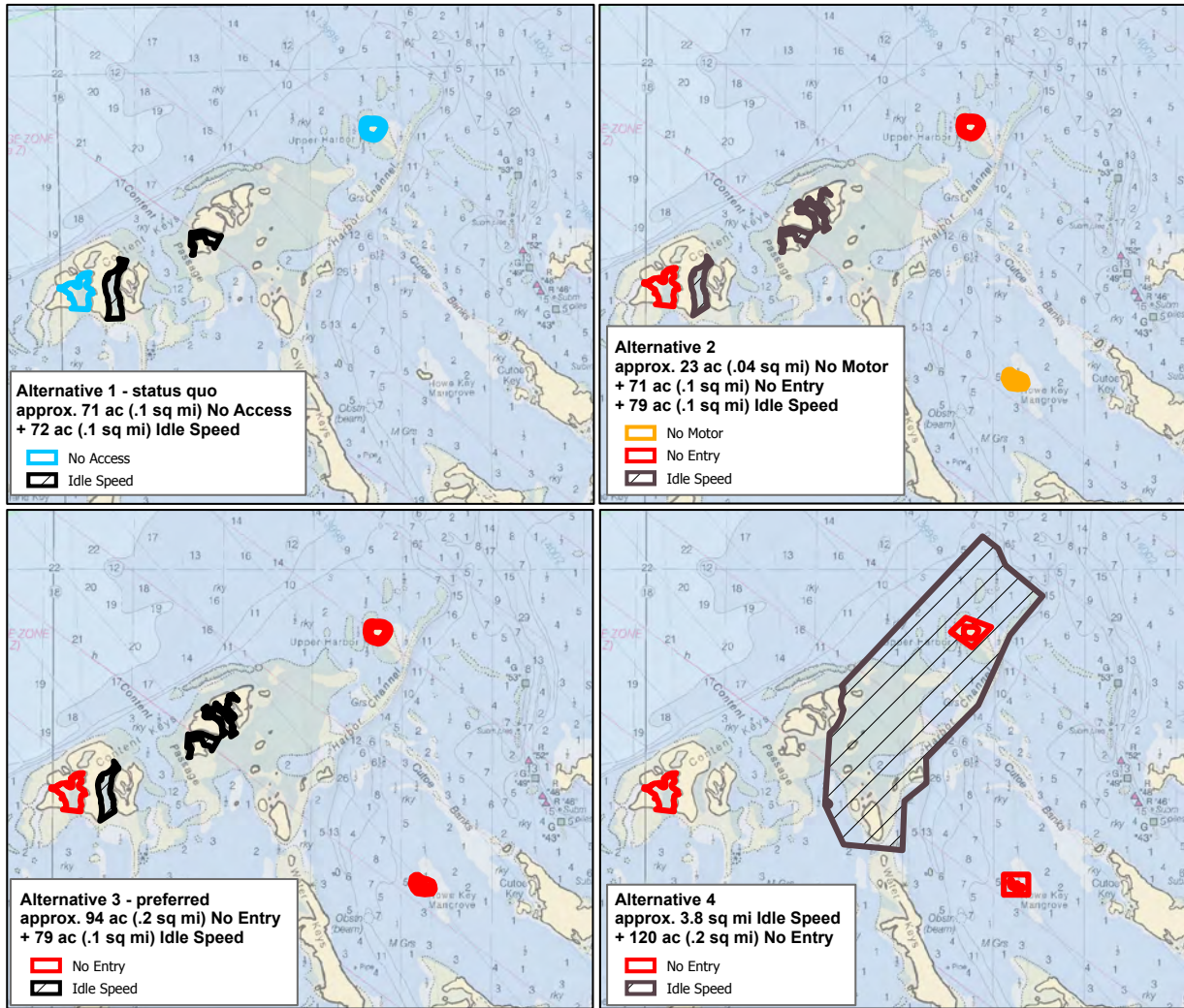
Looe Key Existing Management Area/Conservation Area, Special Use Areas, and Sanctuary Preservation Area



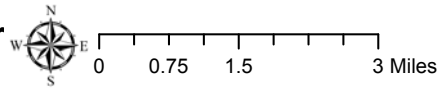
The EMA/MA, designated in 1981 as a national marine sanctuary, this zone includes a SPA and SUA. Reef habitats historically supported large thickets of ESA-listed elkhorn coral and pillar coral. The site currently contains the only remaining remnant elkhorn thickets within the Lower Keys, along with unusually large colonies of ESA-listed star corals and pillar corals. The site contains premier snorkel and dive locations and is renowned for high relief spur-and-groove habitats, undercut ledges and swim-throughs that support diverse fish assemblages. It also contains a large coral nursery and is an ongoing site for coral restoration of staghorn and elkhorn. The SUA/CA protects a system of offshore patch reefs with a linear reef margin, extensive sand plain and seagrass meadows, and low profile spur-and-groove reefs. Provides an area for comparative research studies including effects of low versus high use as it is within the complex of Looe Key EMA and Looe Key SPA. Historically supported large stands of ESA-listed staghorn corals and star coral and currently contains an offshore coral nursery along with important restoration sites. The SPA protects an area of transitional coral reef features and other benthic communities including seagrass. This zone was originally designed to limit consumptive activities and separate users engaged in different activities. This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

Lower Keys Region





Content Keys and Upper Harbor Key Flats, Upper Harbor Key, East Content Keys, West Content Keys, and Howe Key Wildlife Management Areas

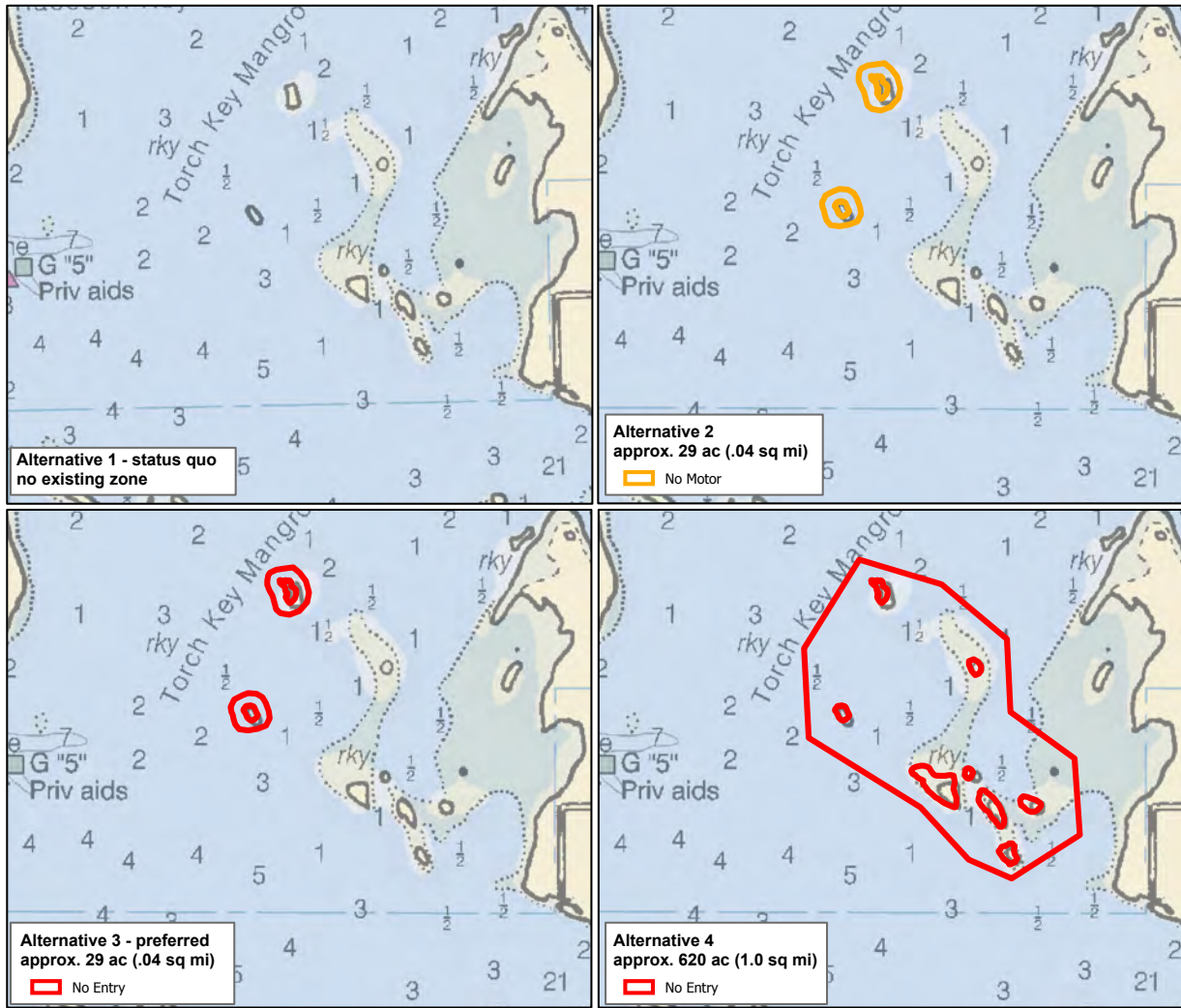


These WMAs collectively decrease disturbance of various bird species including osprey, magnificent frigatebird, double-crested cormorant, heron, white ibis, and other wading birds. Decreases impacts to shallow water seagrass and hardbottom habitat. Some of the surrounding flats and shallow banks exhibit light prop scarring. This zone will reduce conflict between users (flats fishermen and boaters) and protect shallow seagrass flats.

Lower Keys Region

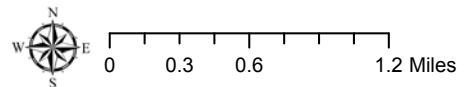


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Torch Key Mangroves Wildlife Management Areas

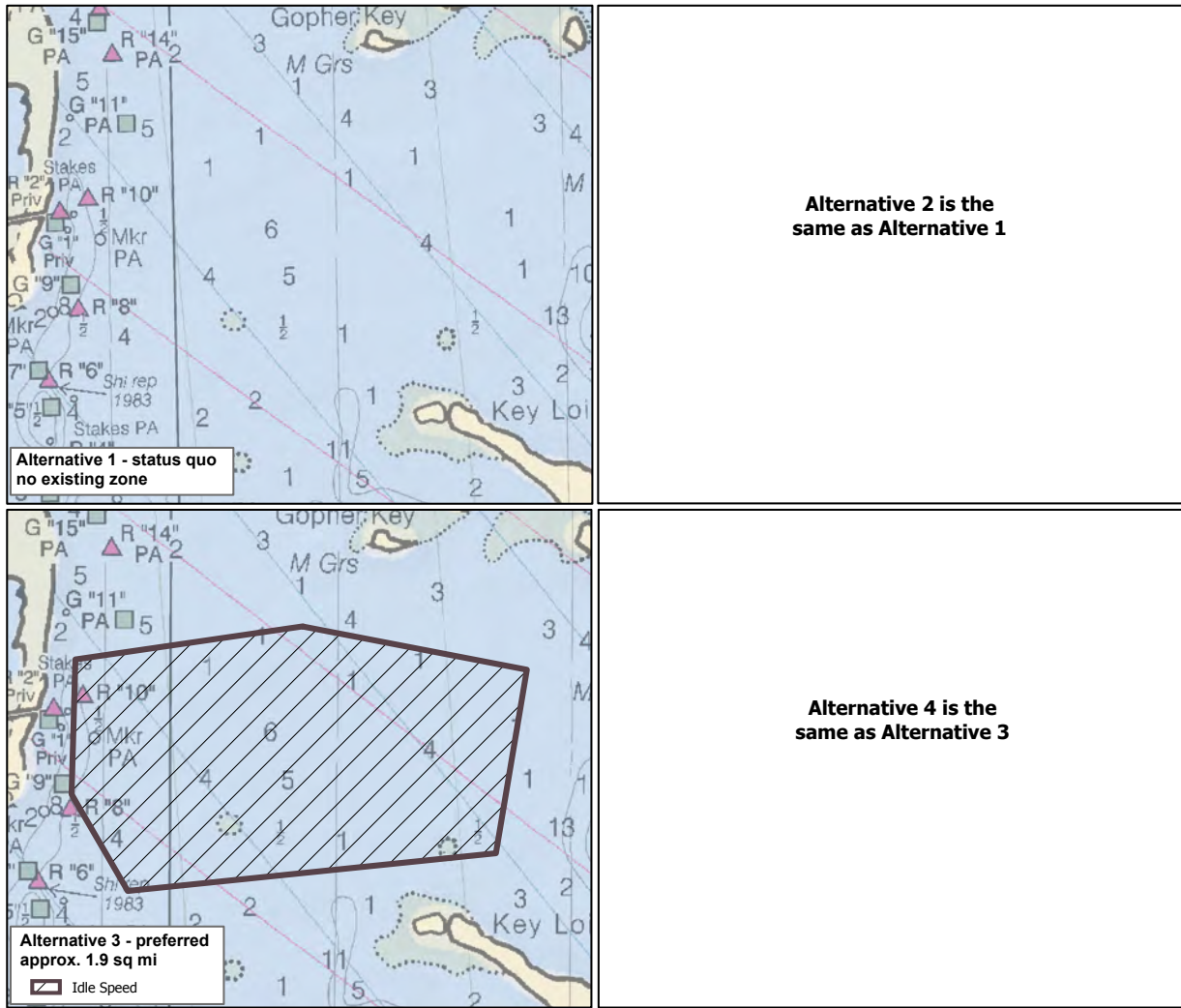
Decreases disturbance of nesting and roosting habitat for various birds including magnificent frigatebird, great white heron, and reddish egret, and is shallow water foraging habitat for wading and shorebirds.



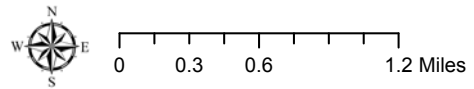
Lower Keys Region



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Key Loys and Loggerhead Basin Wildlife Management Area

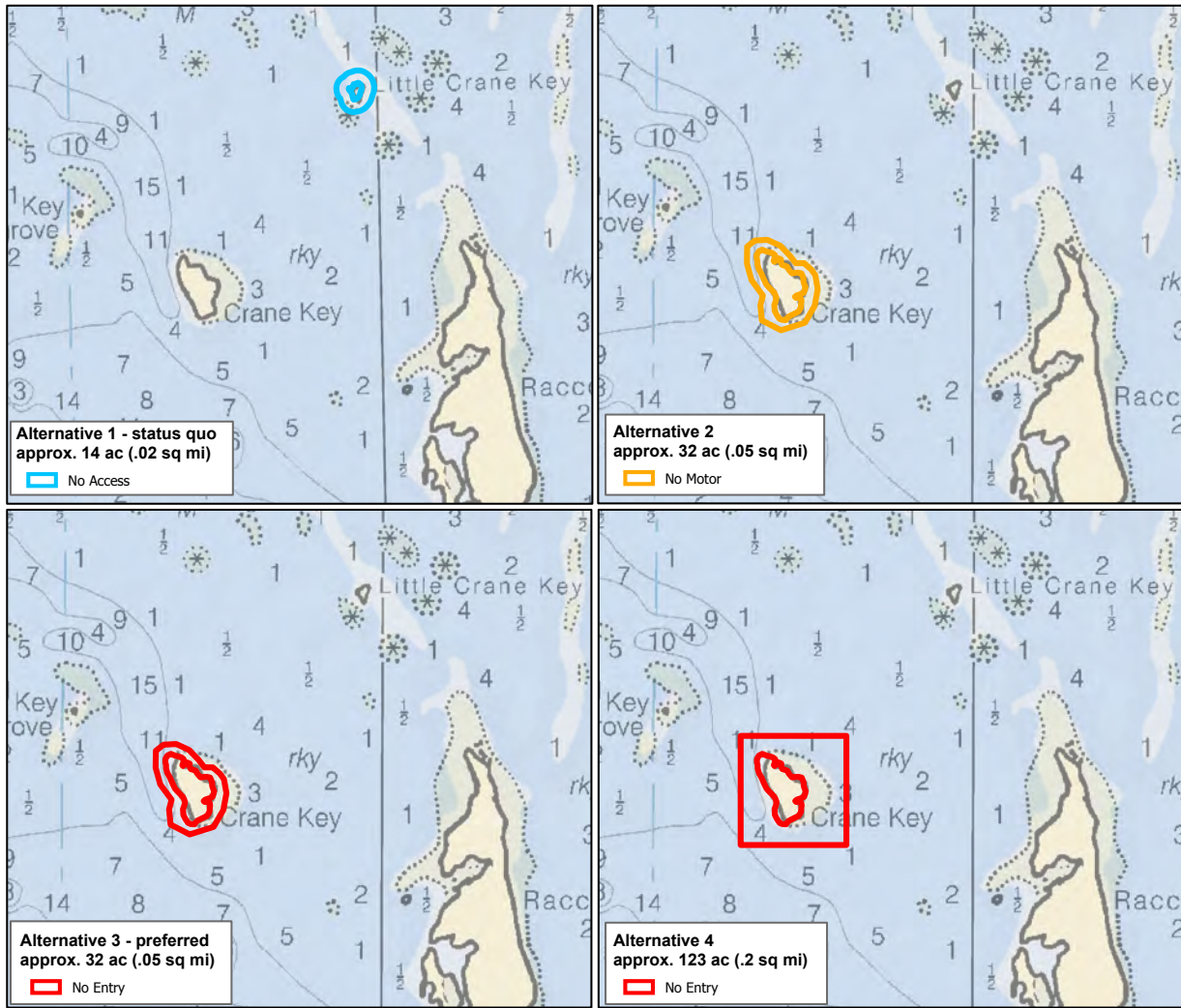


Decreases impacts to shallow water habitat adjacent to Bow Channel. Many of the shallow seagrass flats in this area exhibit light-to-moderate prop scarring. Decreases disturbance to migrating tarpon that use this basin from February through June. Decreases user conflict between flats fisherman and transiting boaters.

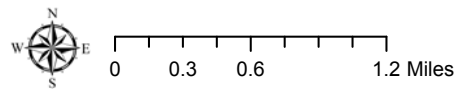
Lower Keys Region



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Little Crane Key and Crane Key Wildlife Management Areas

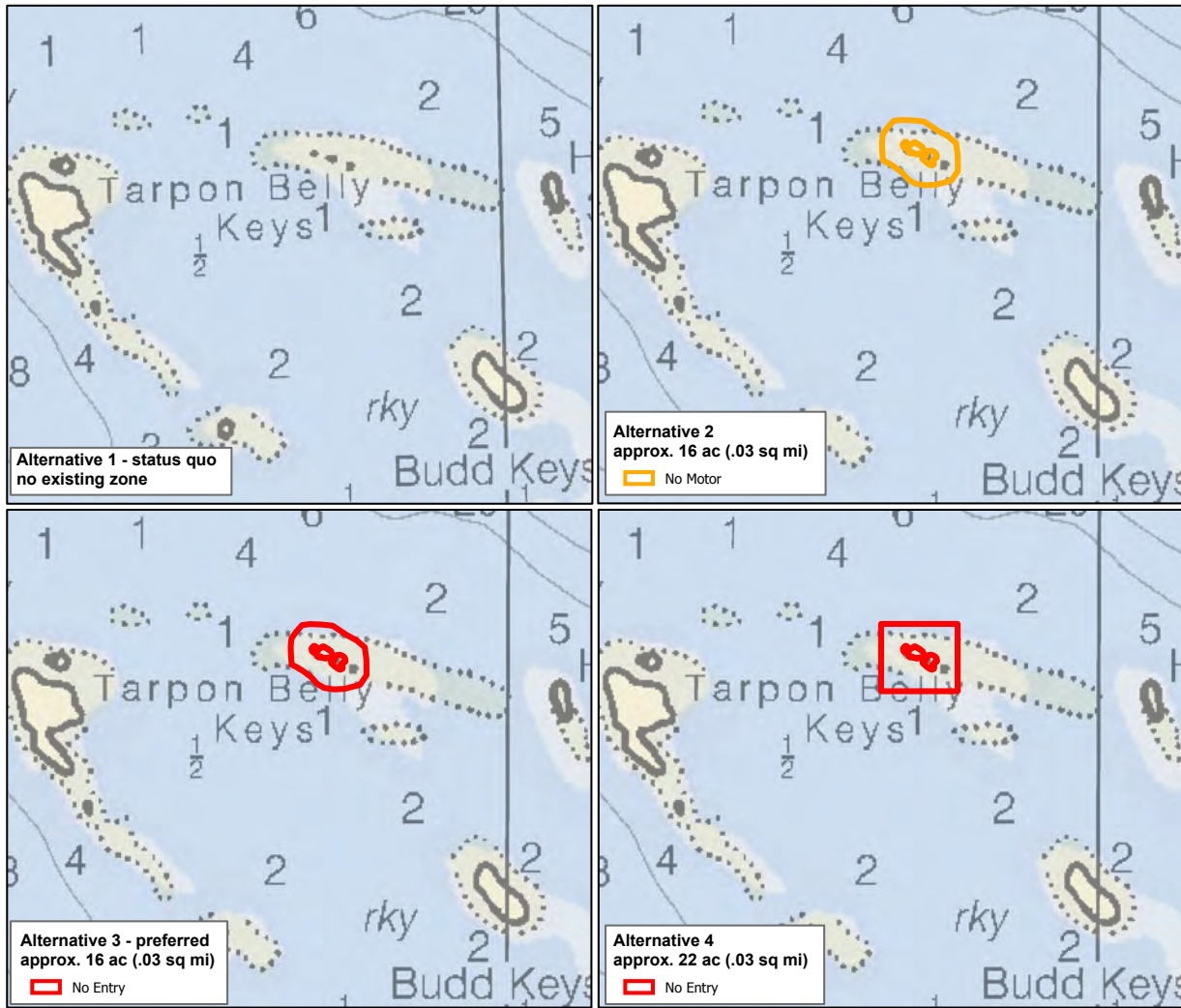


Crane Key WMA decreases disturbance of nesting and roosting birds including magnificent frigatebird and great white heron. Little Crane Key WMA is eliminated. The area shifted following storm events and no longer supports nesting and roosting sites.

Lower Keys Region

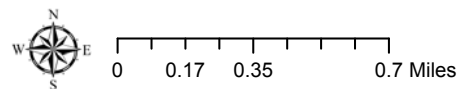


This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

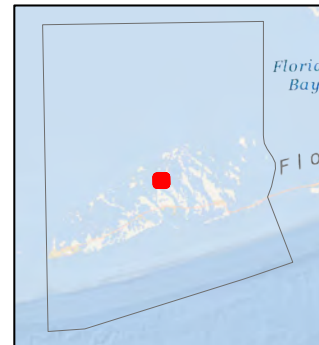


Northeast Tarpon Belly Keys Wildlife Management Area

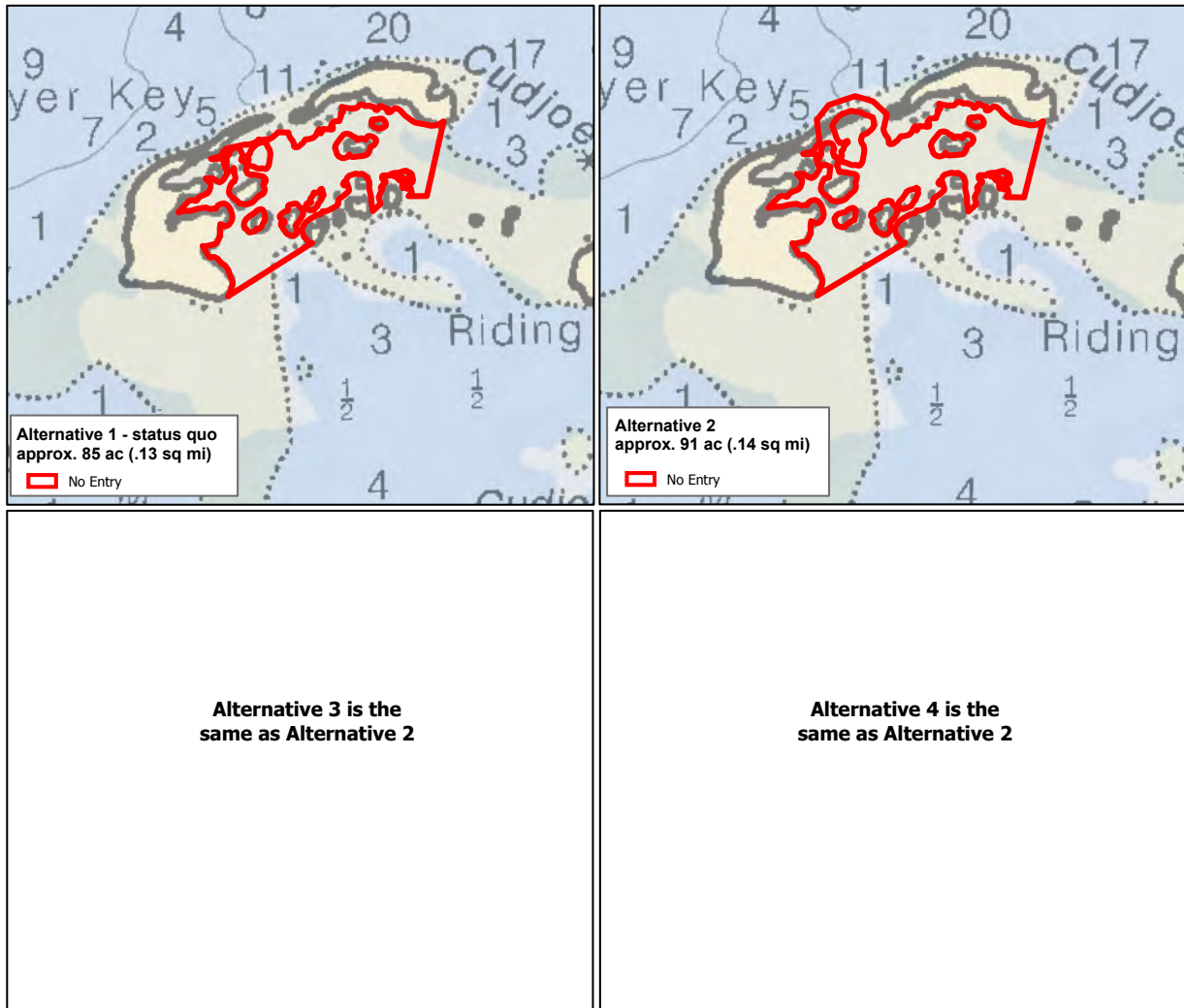
Decreases disturbance of nesting and roosting sites for magnificent frigatebirds.



Lower Keys Region

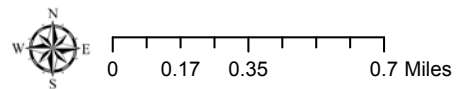


This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

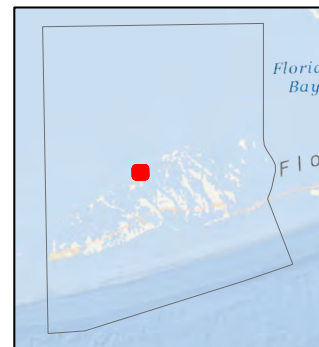


Sawyer Keys Wildlife Management Areas

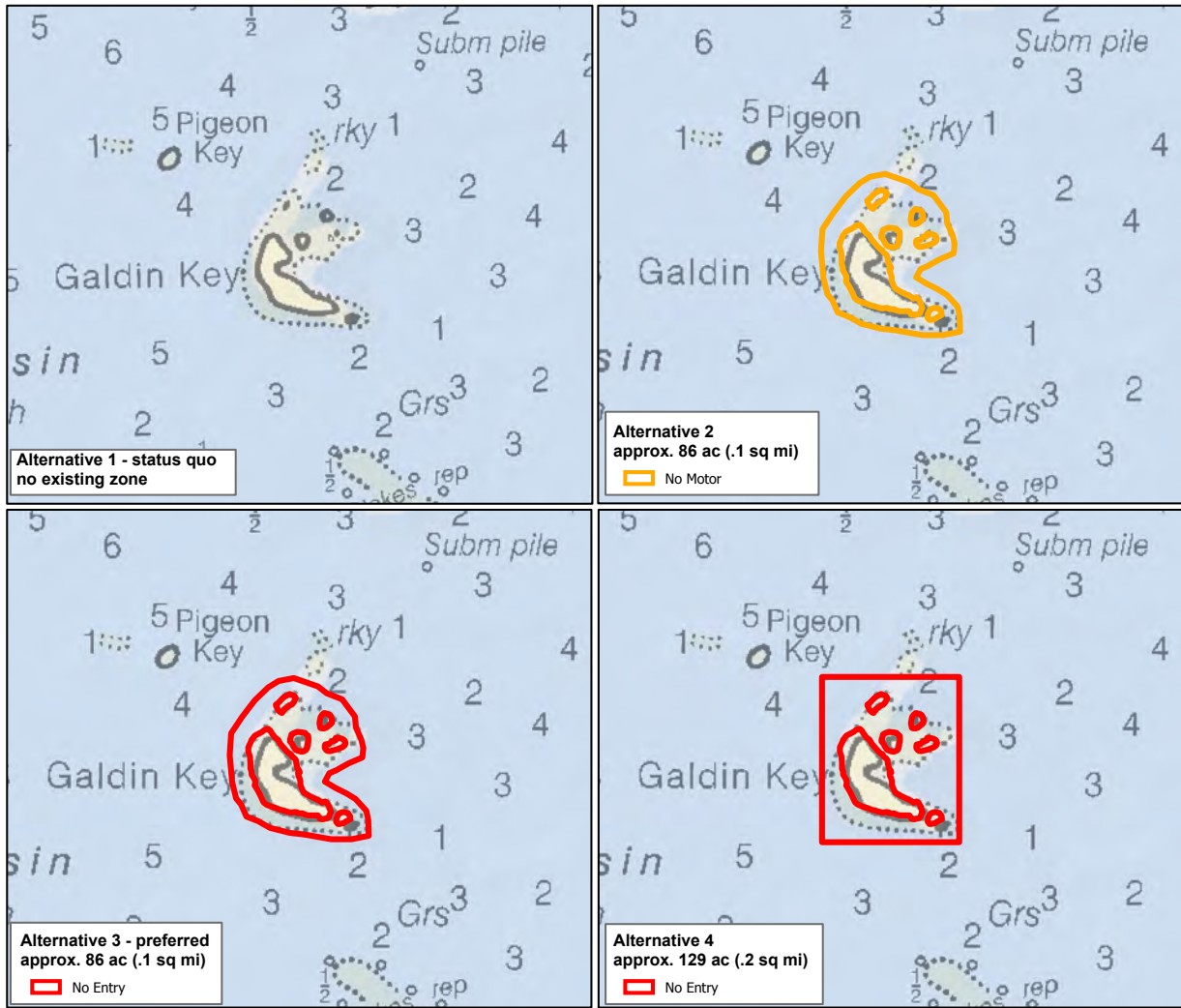
Decreases disturbance of nesting birds including osprey and several species of wading birds, and is a staging area for migrant shorebirds. Decreases disturbance to ESA-listed sea turtle nesting habitat on the northern beach. Surrounding flats and shallow banks to the northeast exhibit light prop scarring.



Lower Keys Region

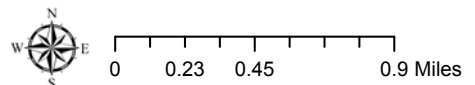


This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

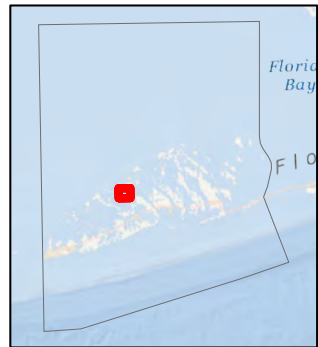


Happy Jack (Galdin) Key Wildlife Management Area

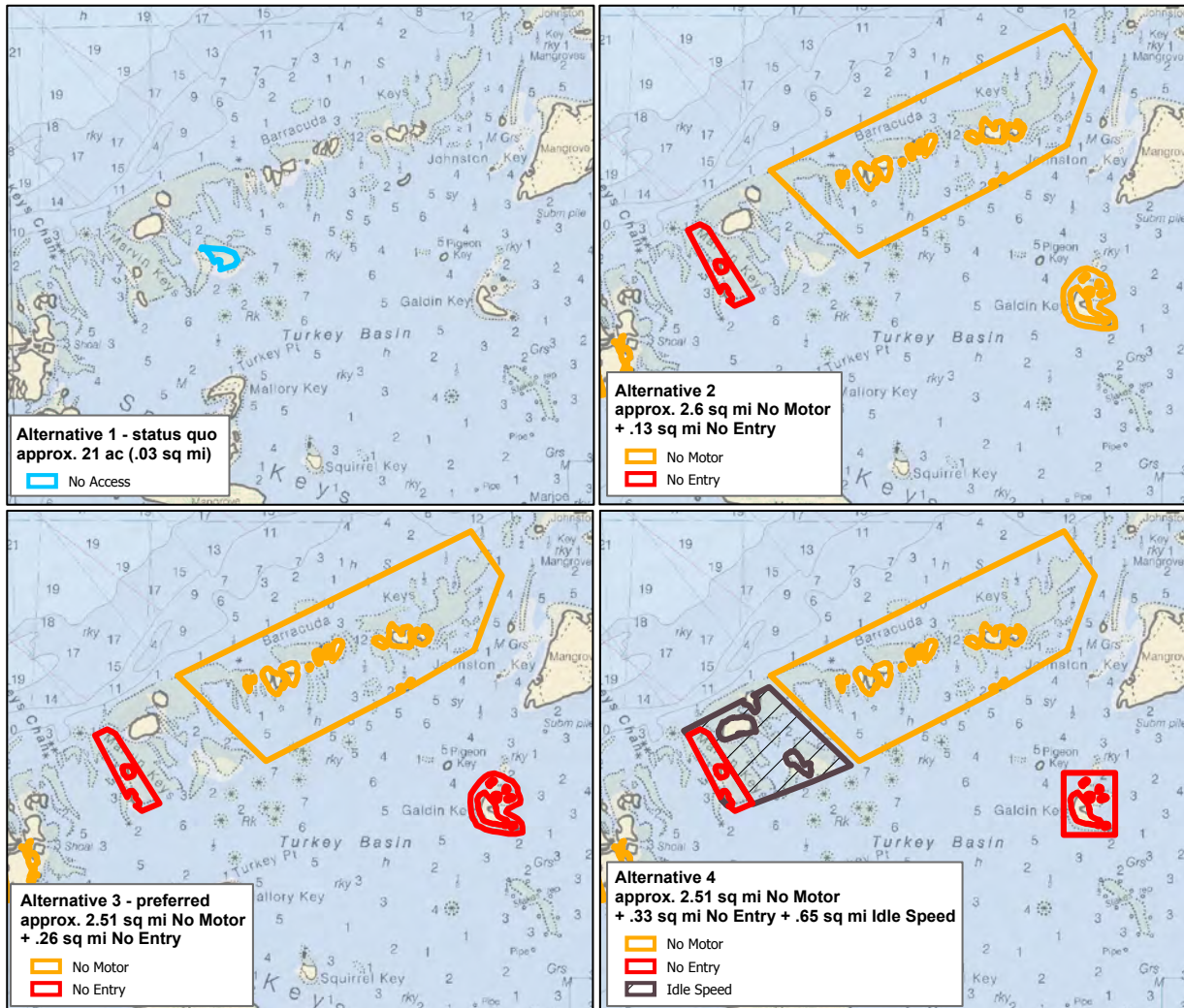
Decreases disturbance of wading bird foraging habitat and nesting reddish egret and great white heron.



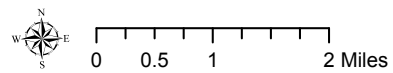
Lower Keys Region



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Marvin Key, Marvin and Barracuda Keys, and Happy Jack (Galdin) Wildlife Management Areas



Marvin Barracuda Key WMA decreases disturbance to important shallow water habitats and the large numbers of resting shorebirds that use the shallow seagrass flats. Decreases conflict of use between flats fisherman and transiting boaters. Maintain use of channels.

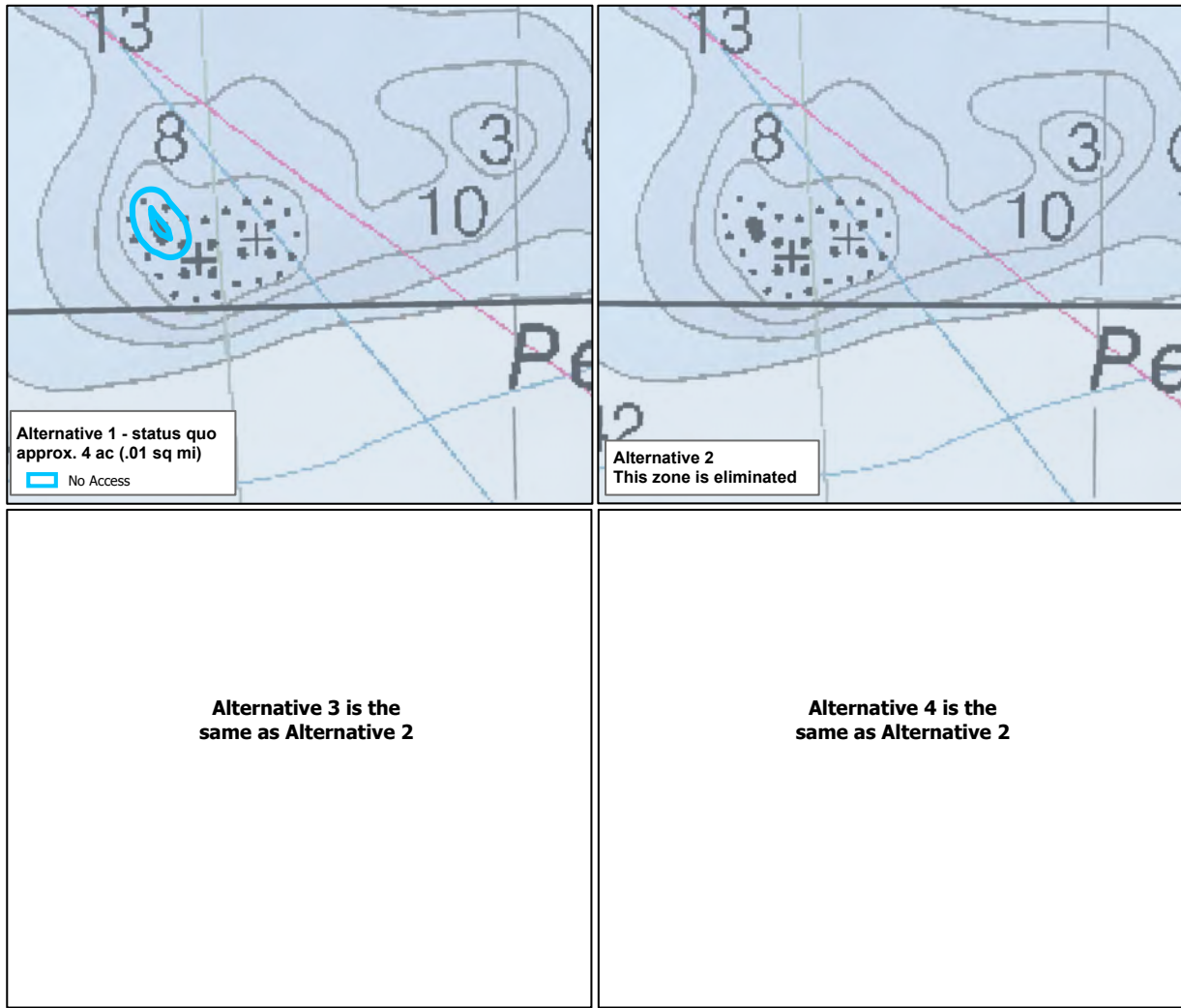
Marvin Key WMA decreases disturbance of resting and foraging shorebirds that use the shallow seagrass flats.

Happy Jack WMA decreases disturbance of wading bird foraging habitat and nesting reddish egret and great white heron.

Lower Keys Region

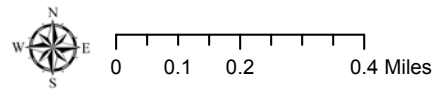


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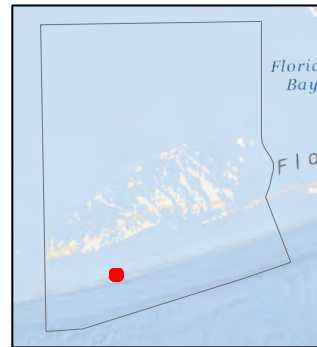


Pelican Shoal Wildlife Management Area

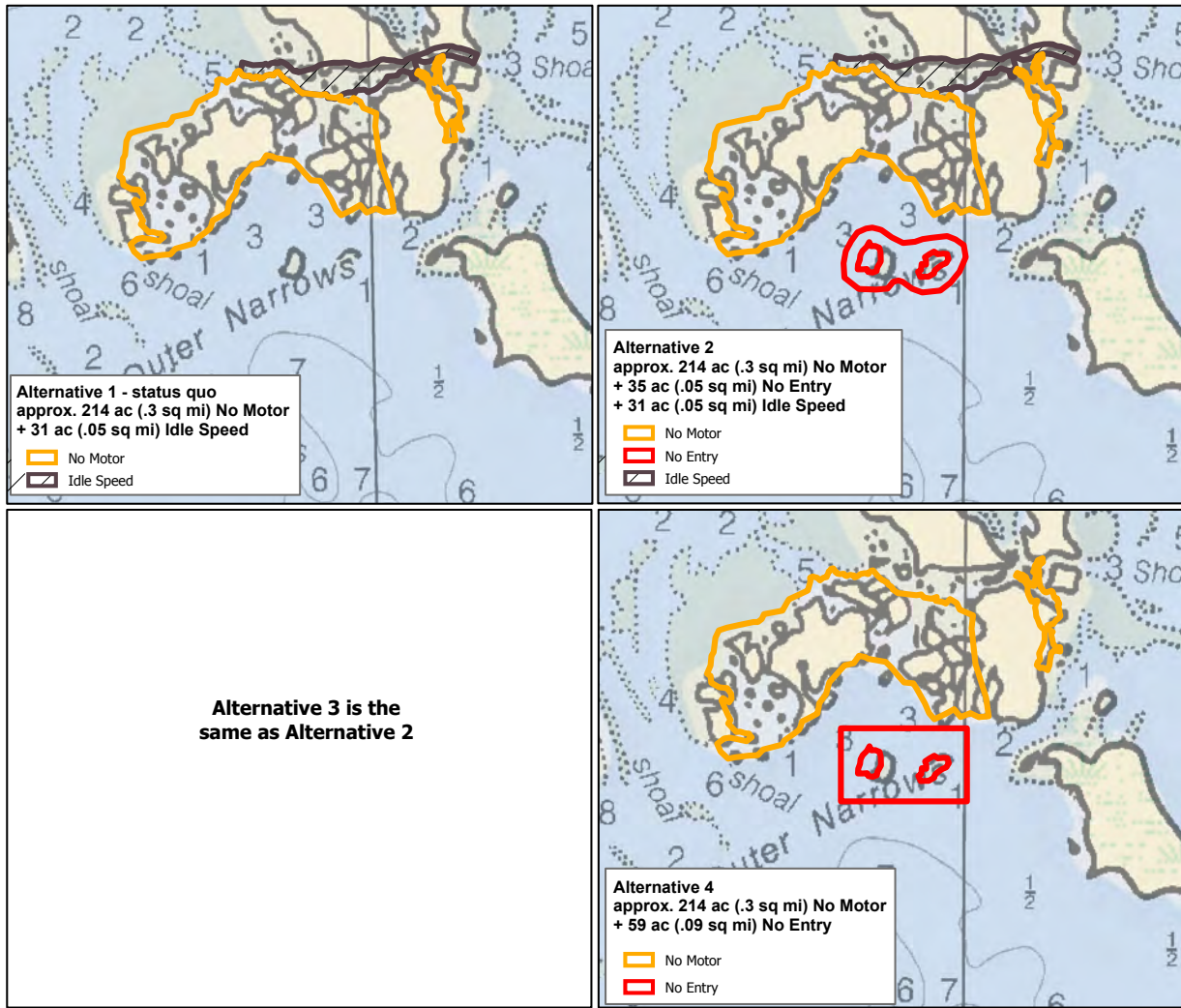
Pelican Shoal WMA was eliminated. The area shifted following storm events and no longer supports nesting and roosting birds.



Lower Keys Region

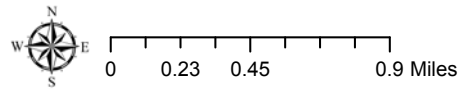


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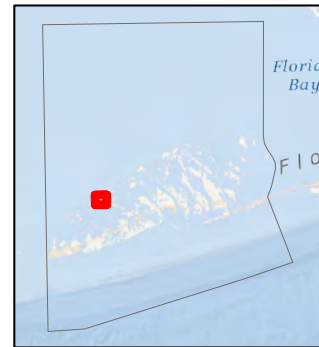


**Snipe Keys
 Wildlife Management Area**

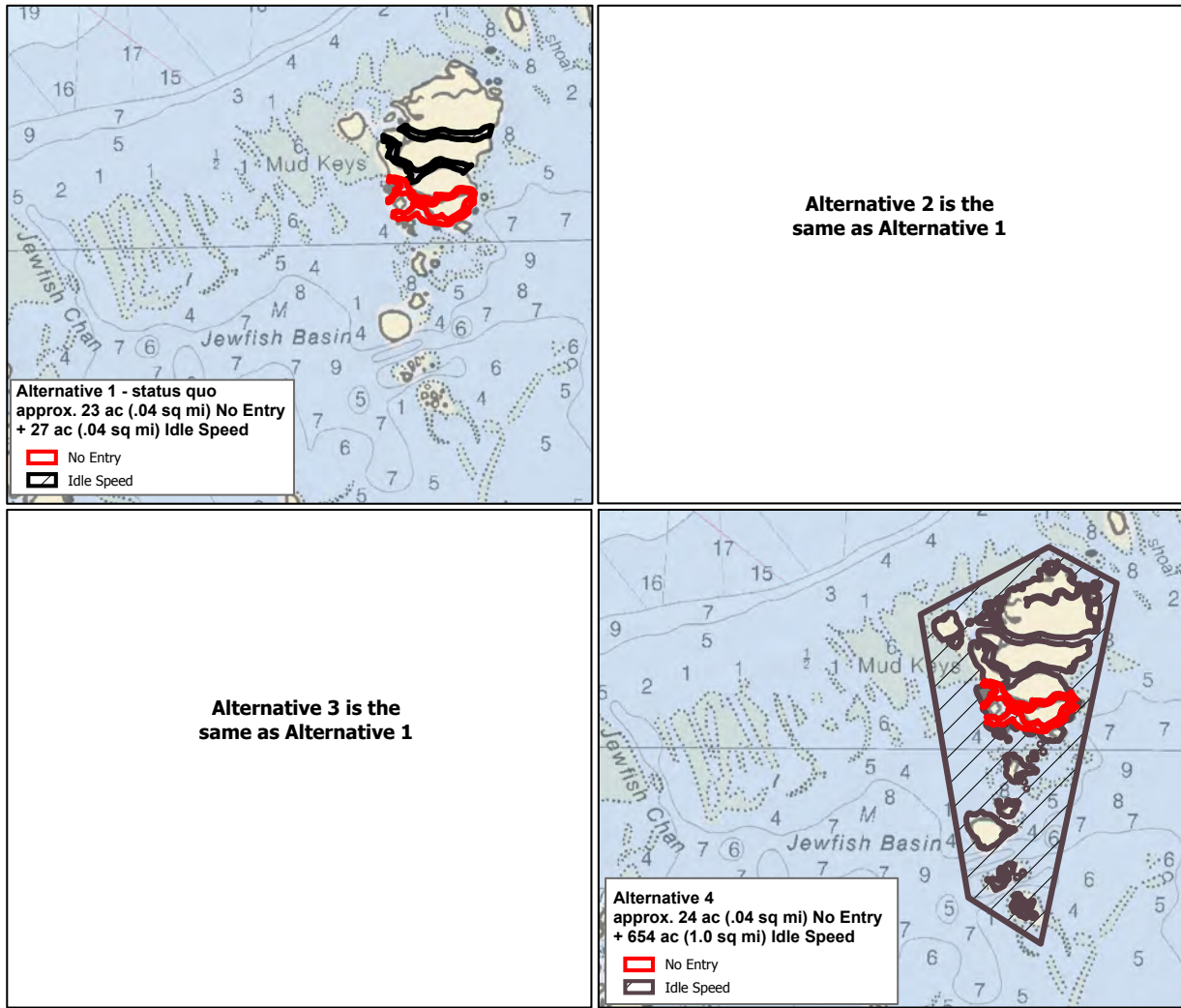
Decreases disturbance of foraging birds including little blue heron, tern, and various shorebirds.



Lower Keys Region

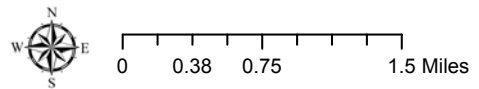


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Mud Keys Wildlife Management Area

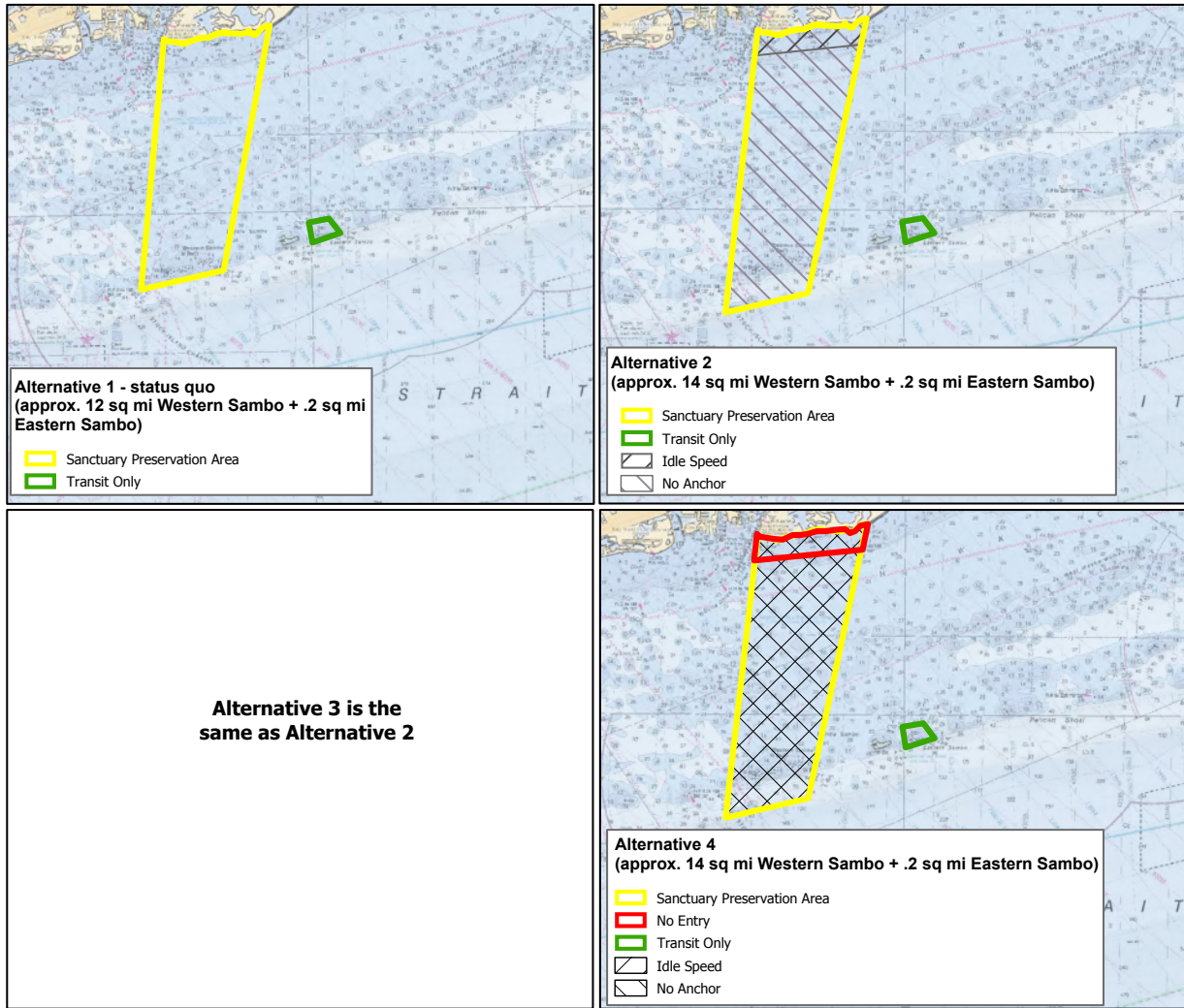
Decreases disturbance of nesting and roosting birds, including osprey and magnificent frigatebird, and a great white heron rookery. Many of the surrounding flats exhibit light prop scarring.



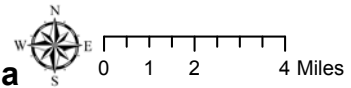
Lower Keys Region



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Western Sambo Sanctuary Preservation Area and Eastern Sambo Special Use Area/Conservation Area



Western Sambo SPA protects a large area of interconnected nearshore and midshelf patch reefs, and a well-developed bank reef with a prominent spur-and-groove habitat along with associated seagrass and hardbottom communities. This zone provides a corridor for the migration of juvenile and adult fish and invertebrate populations. This area meets the advisory council goal to protect large, contiguous, diverse, and interconnected habitats, including for fish moving inshore to offshore through their life cycle.

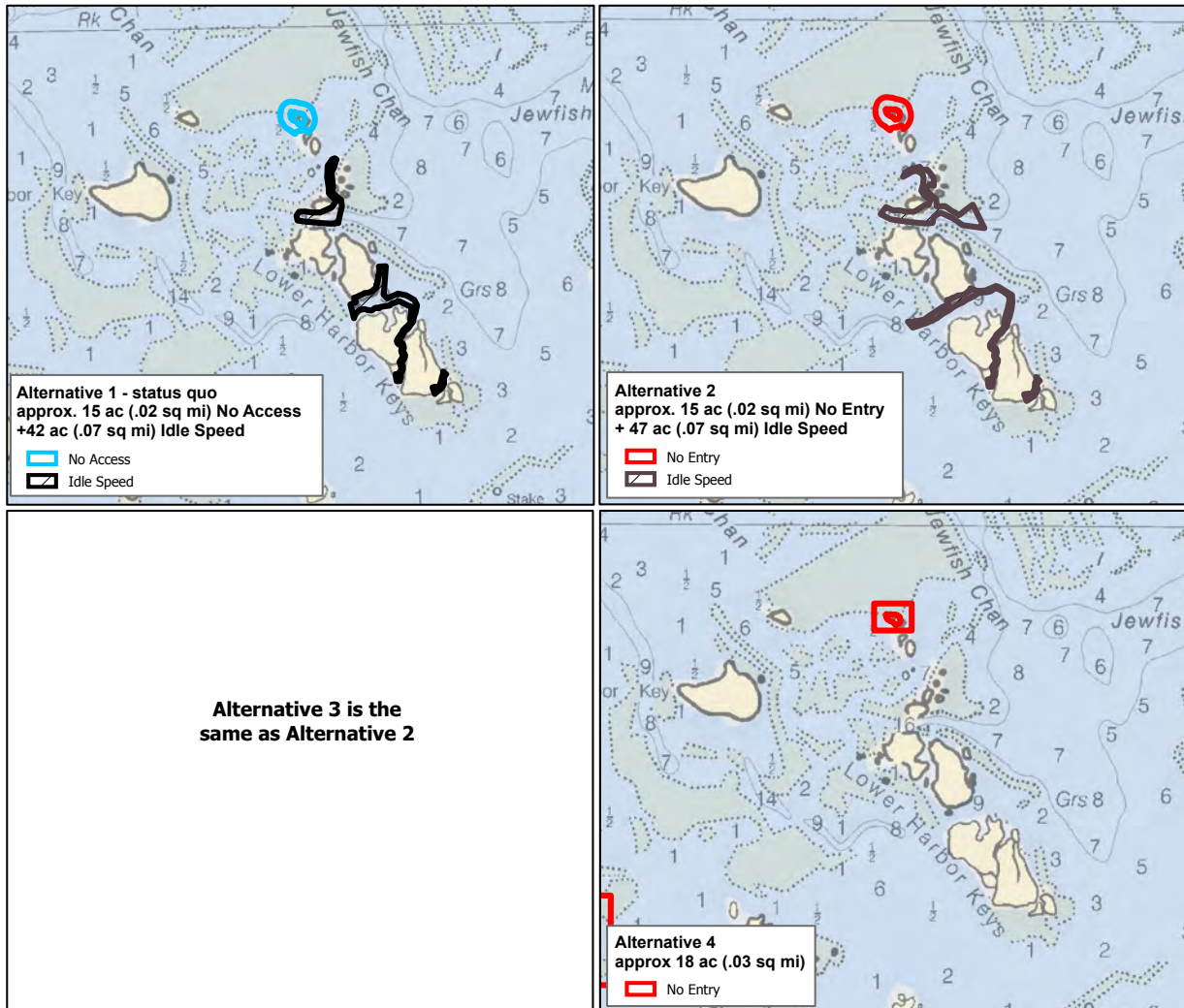
Eastern Sambo SUA protects a well-developed spur-and-groove bank reef that formerly contained thickets of ESA-listed elkhorn and staghorn corals and important breeding populations of queen conch. This zone was originally established to serve as a shallow reef community in an area of good water quality, in comparison with Tennessee Reef, which is located in an area of poor water quality opposite of Florida Bay.

Note: Western Sambo is currently designated as an ecological reserve in Alternative 1, however the regulations applied in this area are similar to those applied in sanctuary preservation areas as shown here.

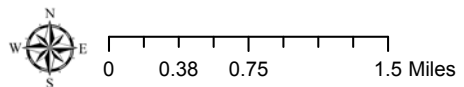
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Lower Keys Region





East Harbor Key and Lower Harbor Keys Wildlife Management Areas



East Harbor Keys WMA decreases disturbance to various resting shorebirds and nesting bald eagles. Lower Harbor Keys WMA decreases disturbance of nesting and roosting birds including great white heron, double-crested cormorant, osprey, and other wading birds. Many of the surrounding flats exhibit light prop scarring.

Lower Keys Region

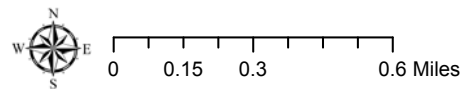


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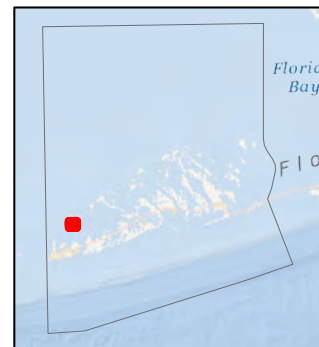


Cayo Agua Keys Wildlife Management Area

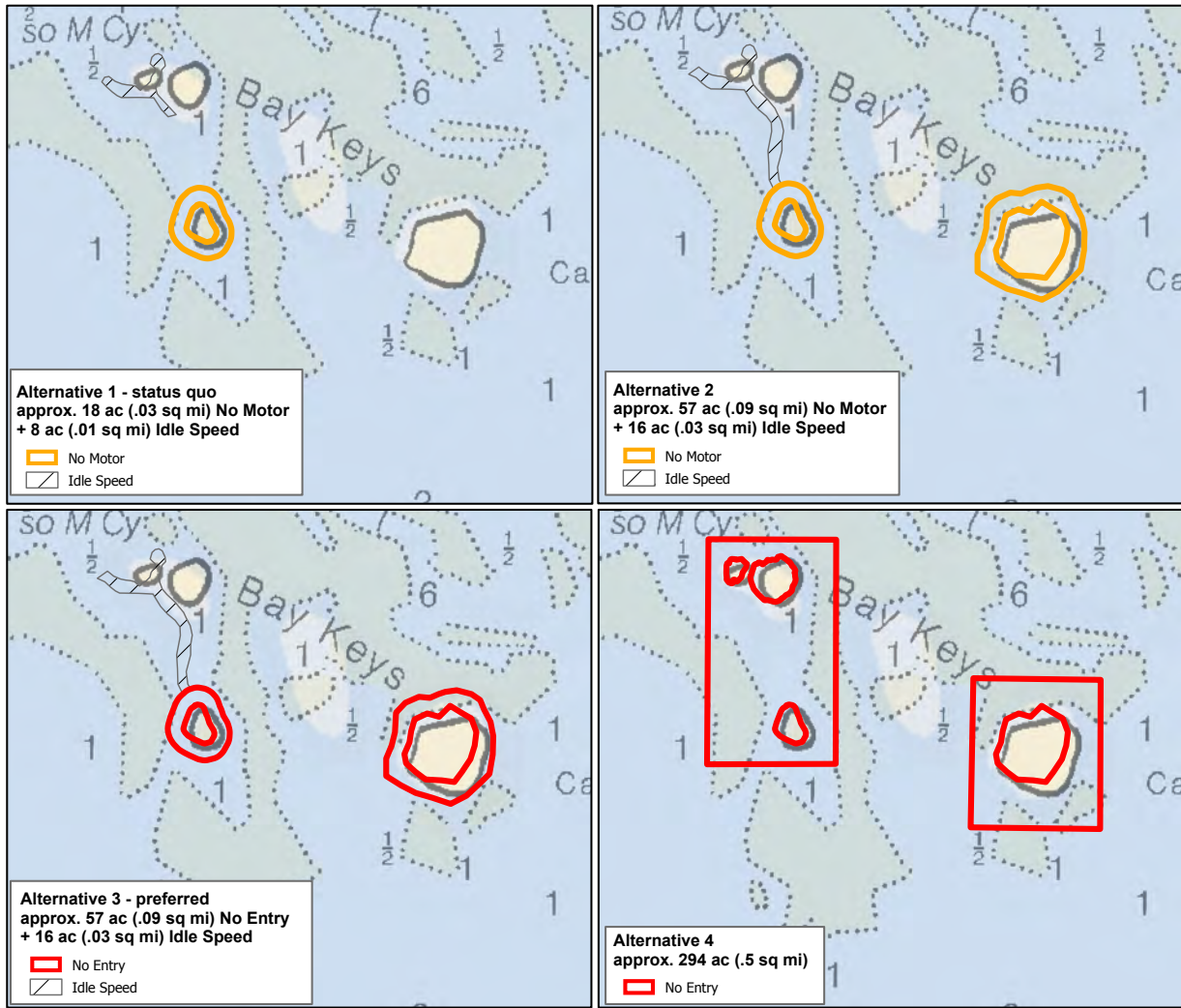
Decreases disturbance of nesting and roosting birds including great white heron, osprey, and the large numbers of resting shorebirds that use the shallow seagrass flats.



Lower Keys Region

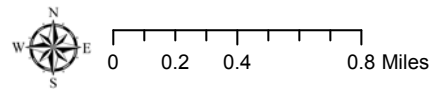


This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.



Bay Keys Wildlife Wildlife Management Area

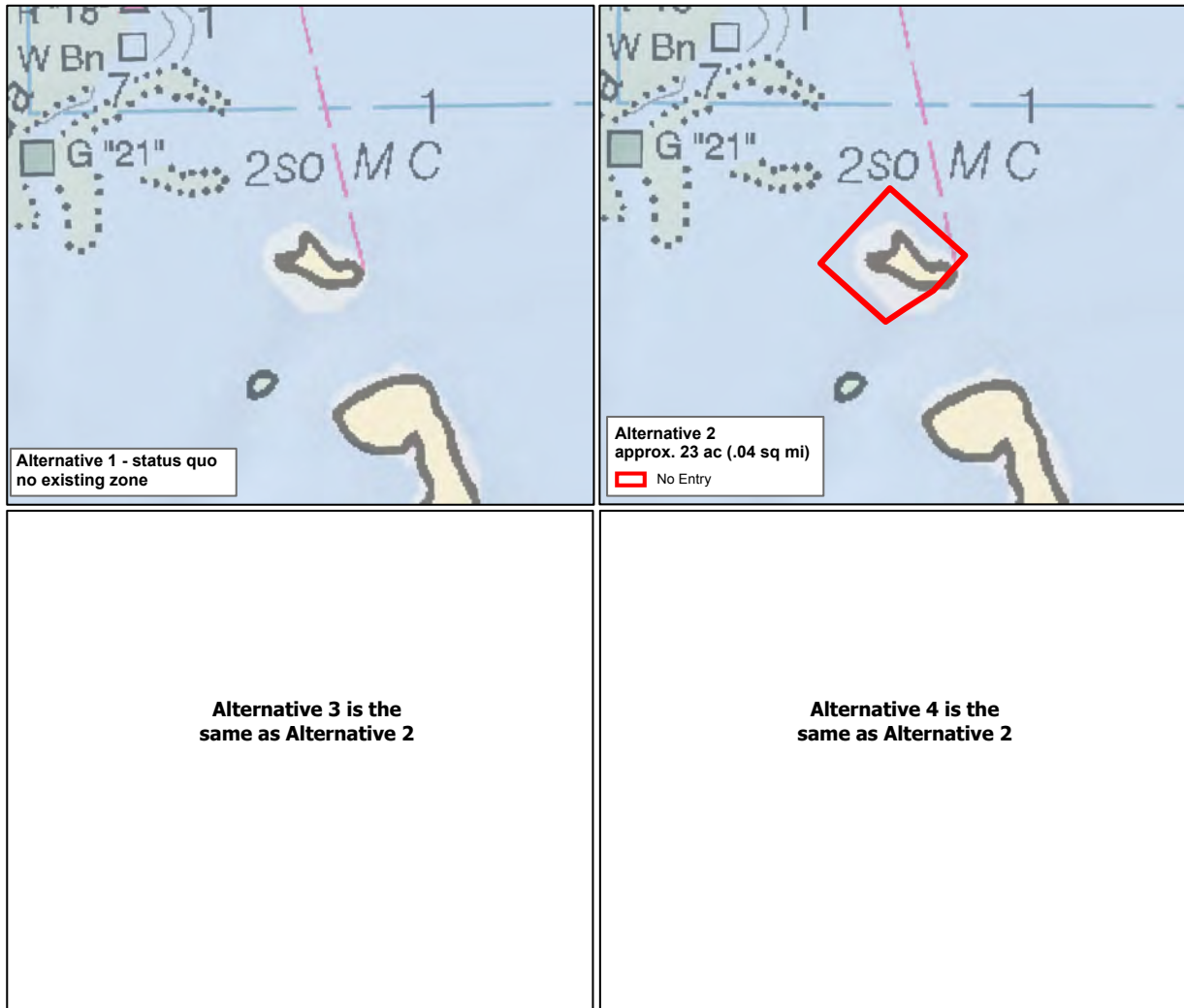
Decreases disturbance of nesting and roosting birds including magnificent frigatebird, great white, tricolor, and little blue heron, cormorant, osprey, and various other small birds. Shallow seagrass flats around the island exhibit light prop scarring.



Lower Keys Region

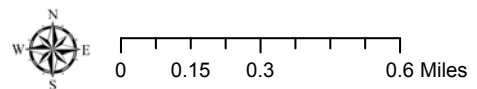


This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

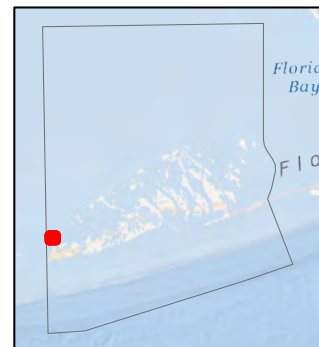


Demolition Key Wildlife Management Area

Decreases disturbance of nesting and roosting birds including great white heron and magnificent frigatebird.



Lower Keys Region

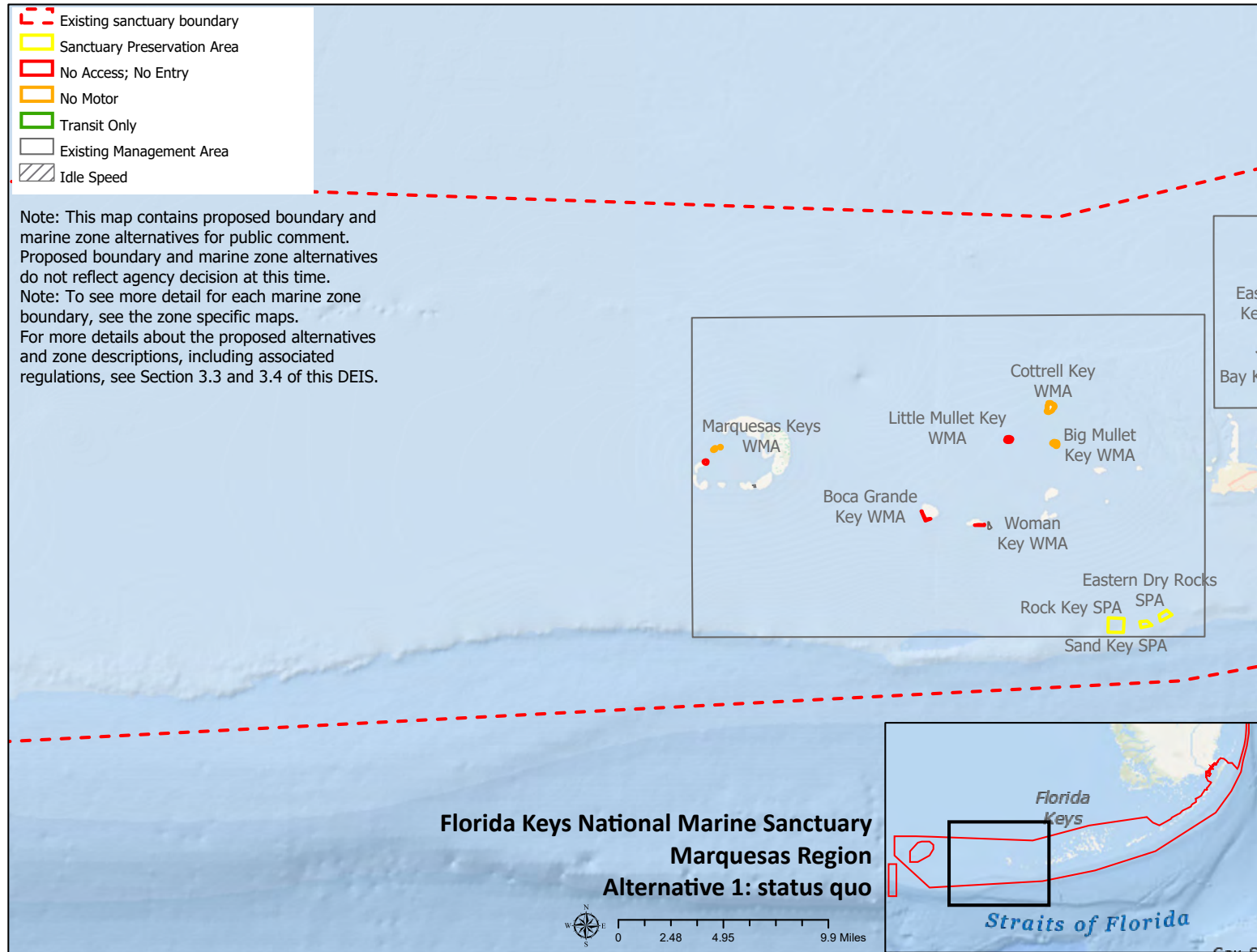


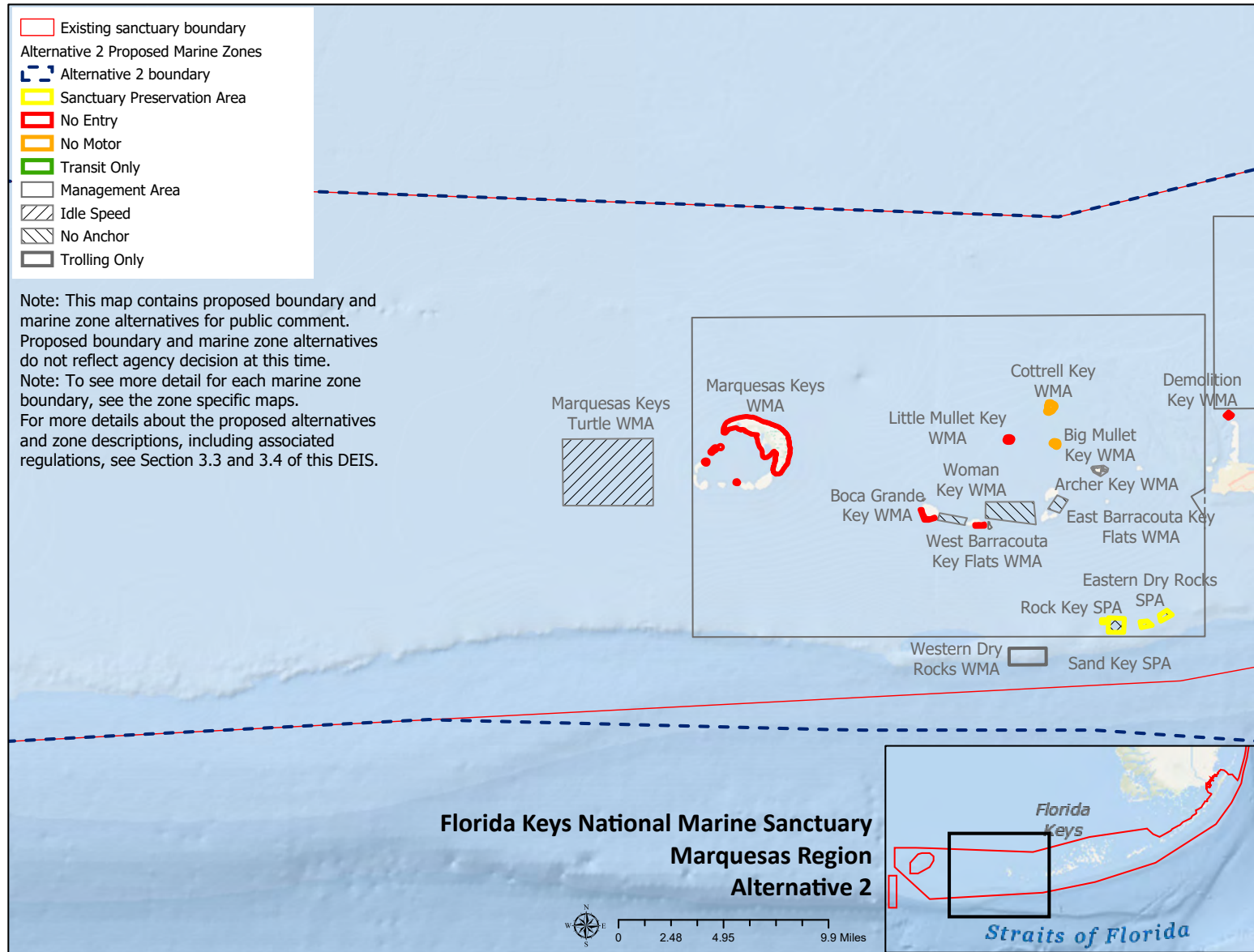
This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

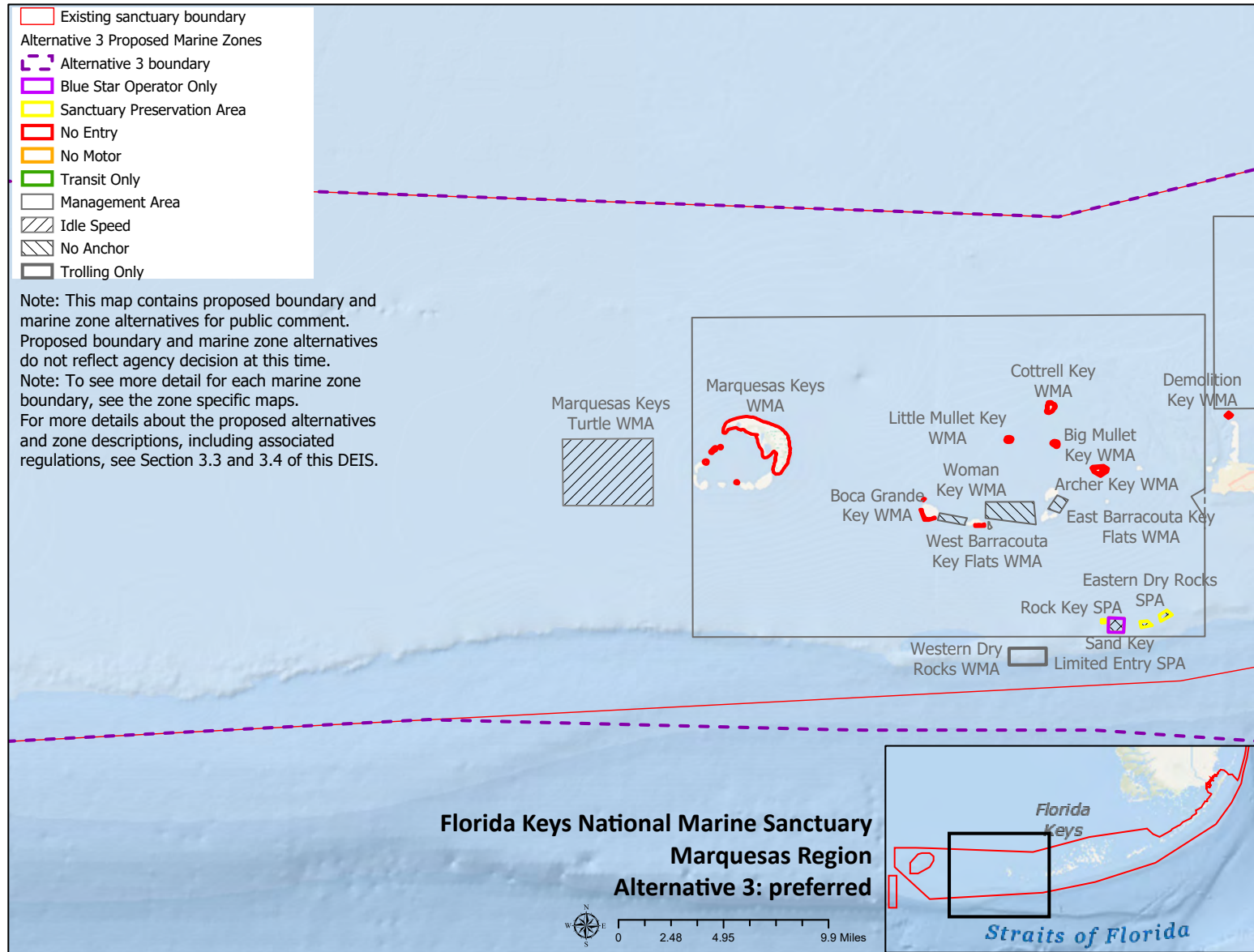
3.6.5 Marquesas Region and Marquesas marine zone alternatives

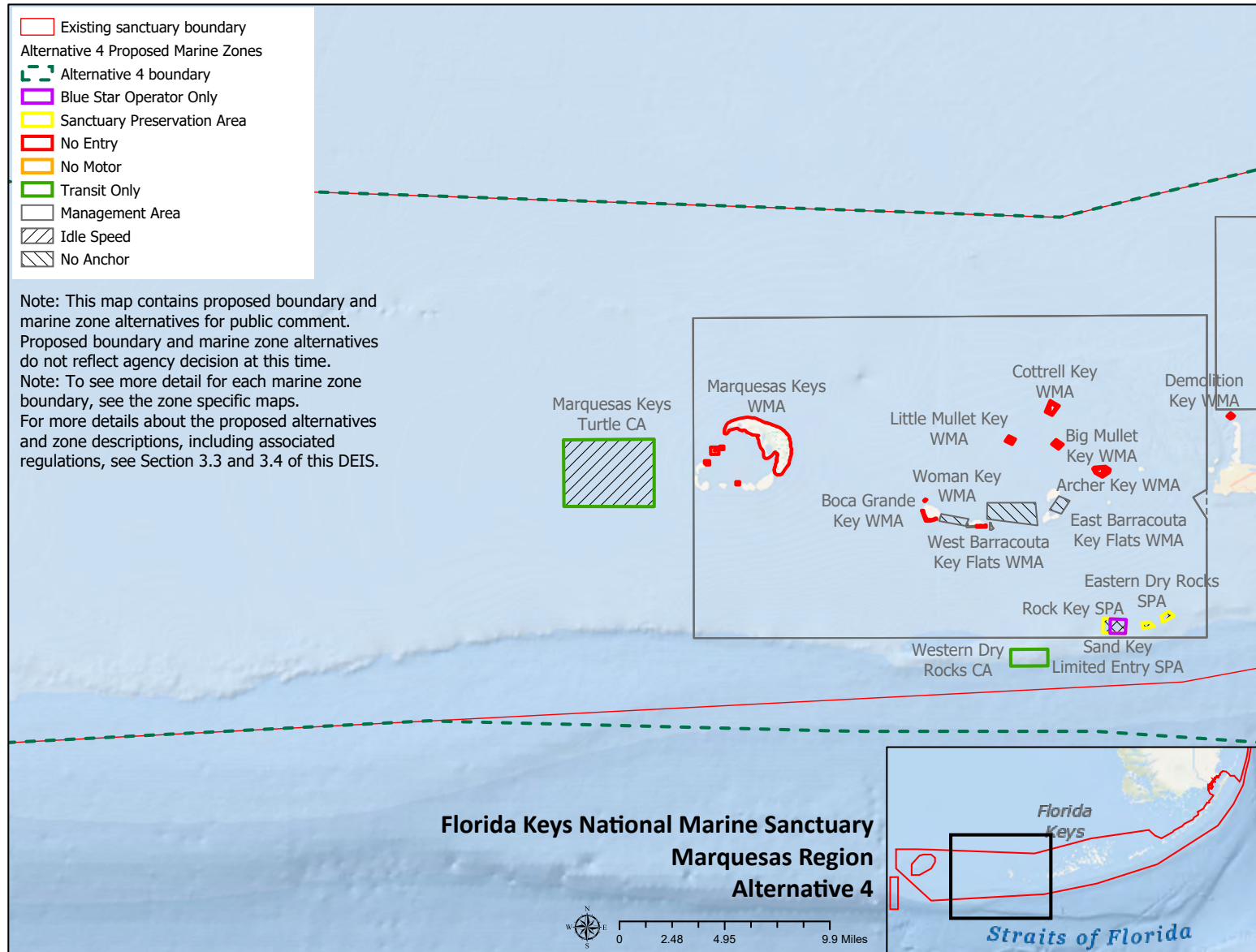


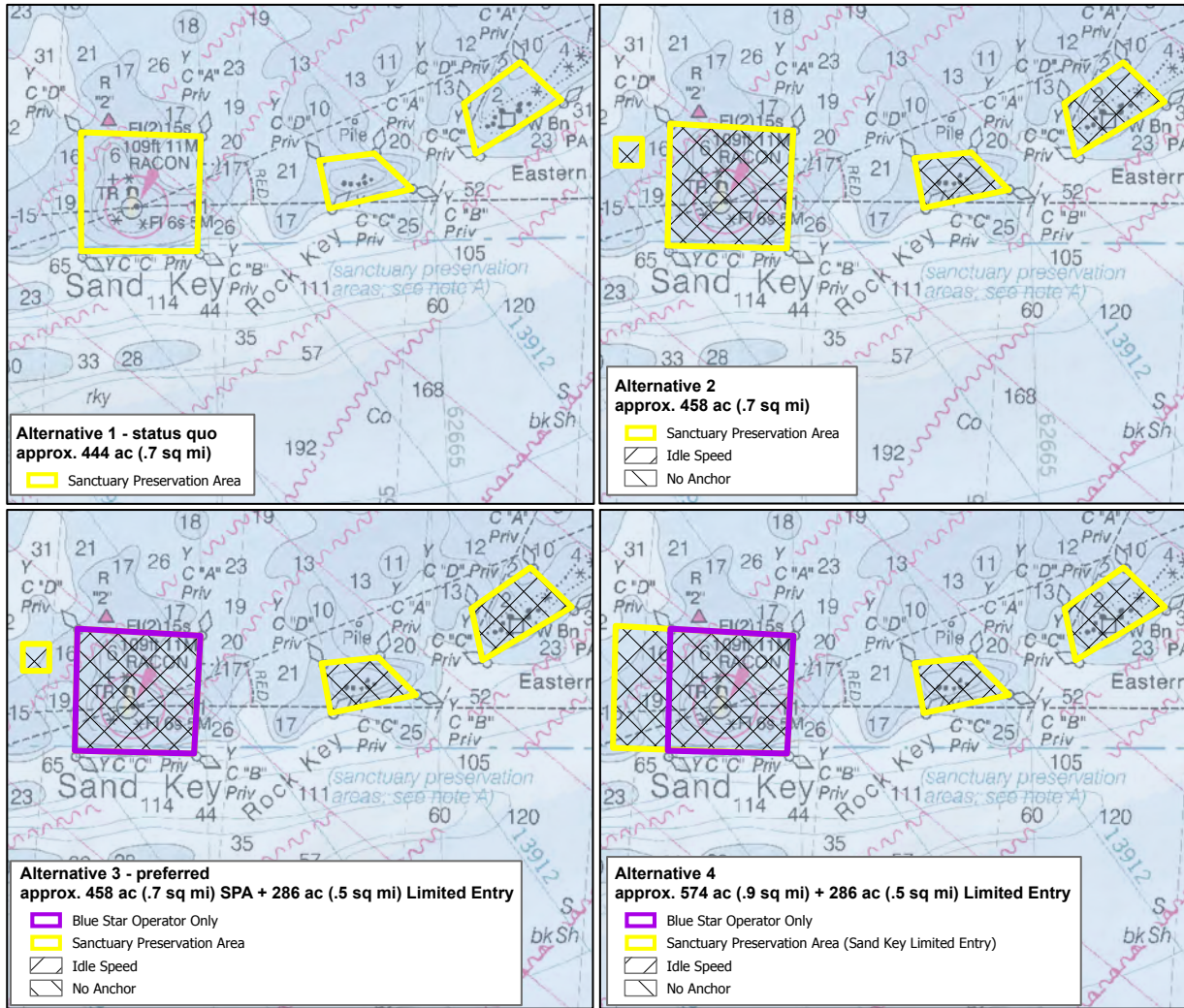
Boca Grande Key Wildlife Management Area in the Key West National Wildlife Refuge lies 14 miles west of Key West, Florida. Photo: USFWS



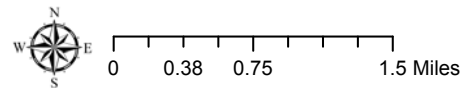






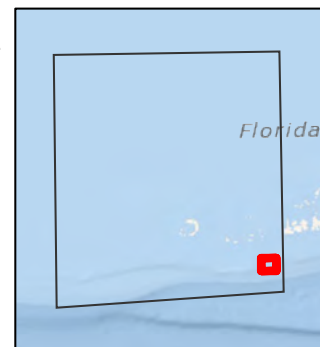


Eastern Dry Rocks, Rock Key, Sand Key, and Key West Sanctuary Preservation Areas

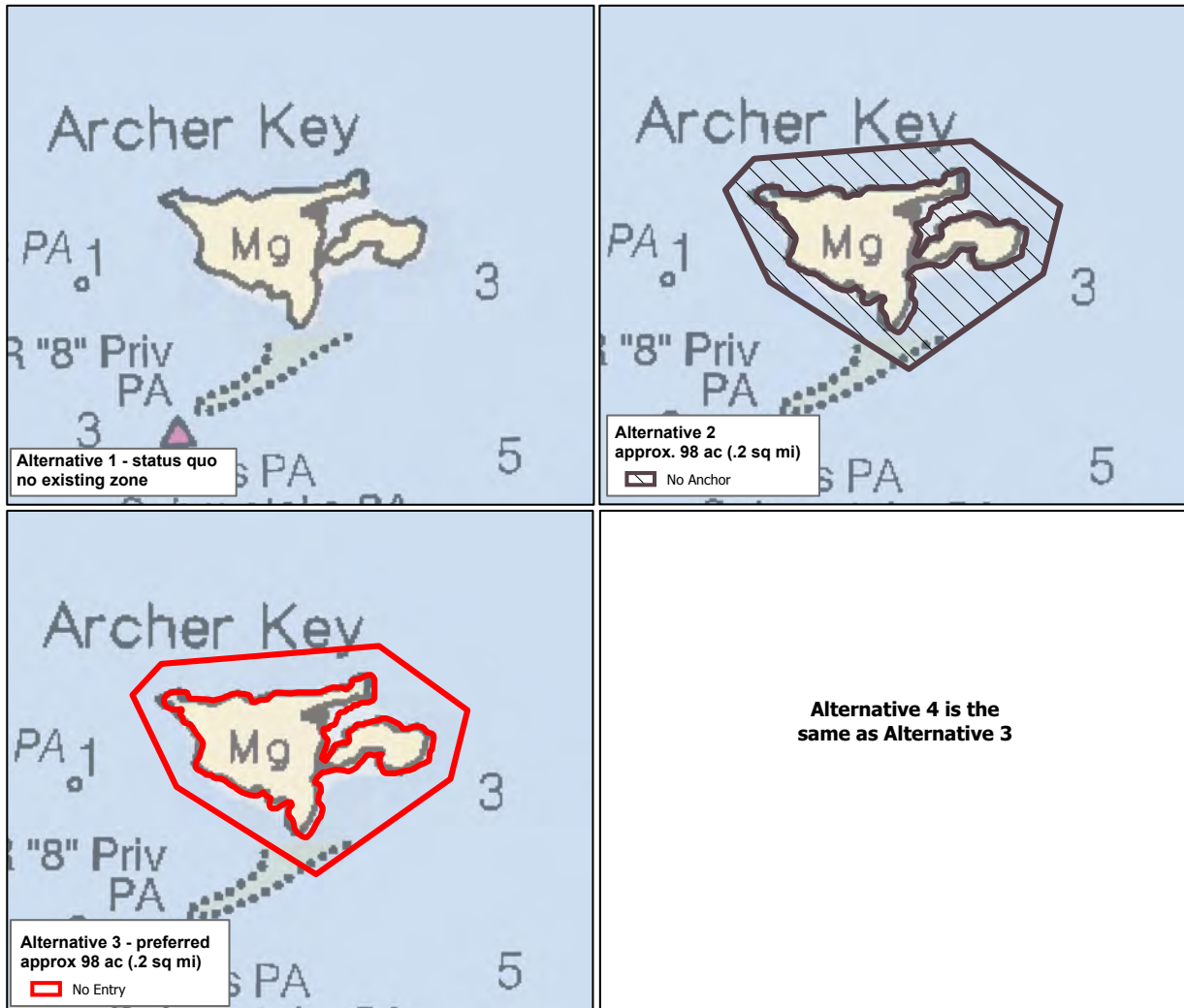


These zones protect spur-and-groove and deeper bank reef habitats that historically supported thickets of ESA-listed elkhorn coral. Currently contain a high abundance of large ESA-listed star corals, remnant populations of ESA-listed pillar corals, and a diverse assemblage of other boulder and plating coral species. Important sites for ongoing restoration of ESA-listed elkhorn and staghorn corals. These zones were originally designed to limit consumptive activities and separate users engaged in different activities. Key West SPA is provided for restoration of degraded coral reef ecosystem sanctuary resources.

Marquesas Region

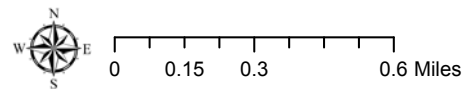


This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

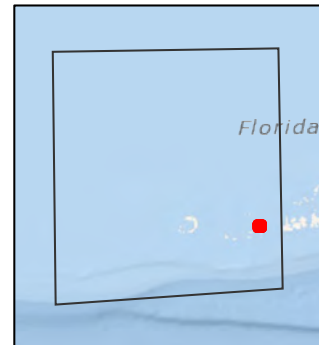


**Archer Key
Wildlife Management Area**

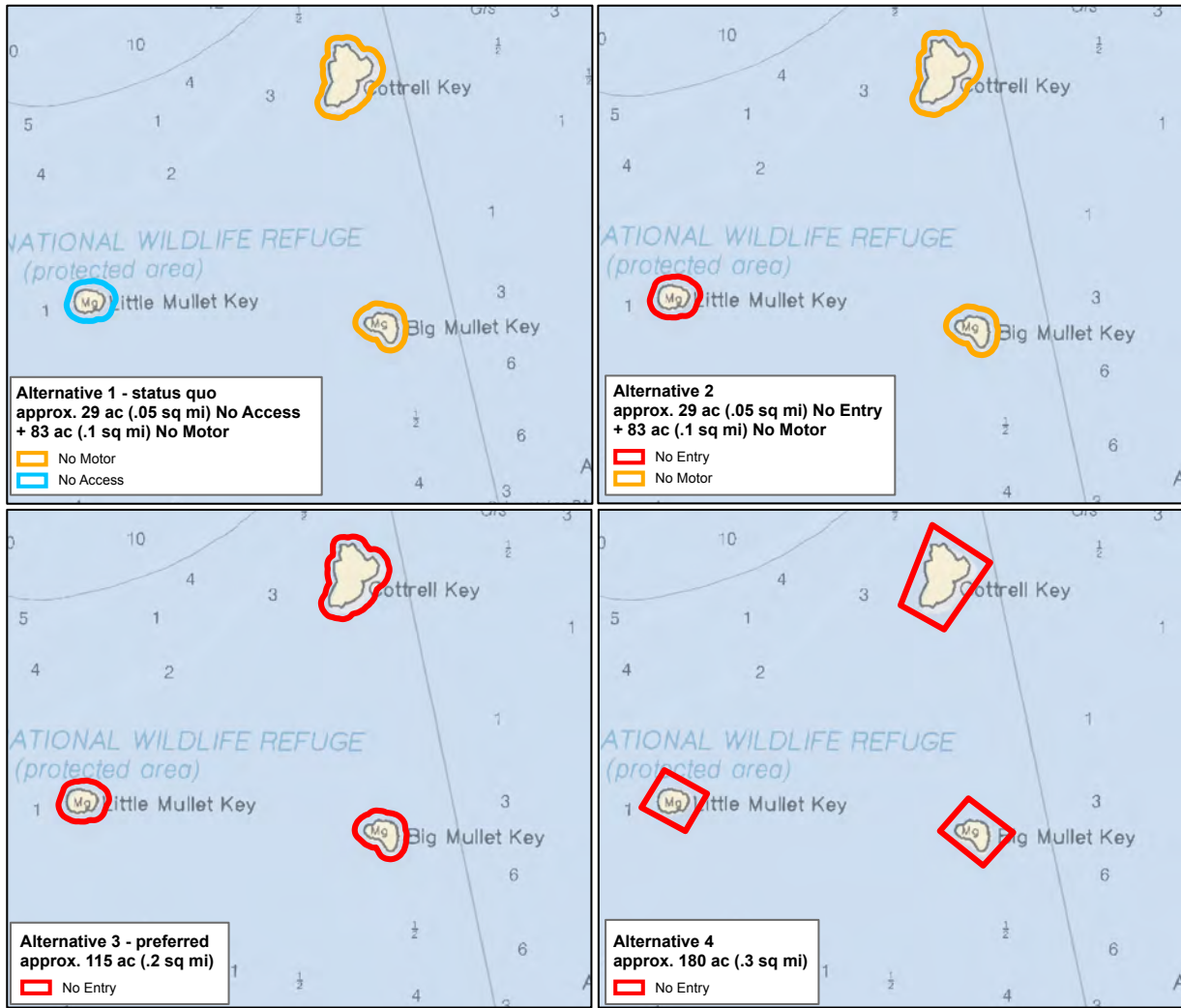
Decreases disturbance of nesting and roosting birds and protects seagrass habitat, soft corals, and sponges. Shallow seagrass flats around the island exhibit light to moderate prop scarring.



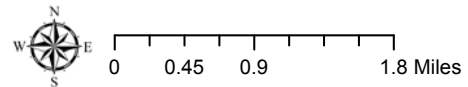
Marquesas Region



This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.



Little Mullet Key, Big Mullet Key, and Cottrell Key Wildlife Management Areas



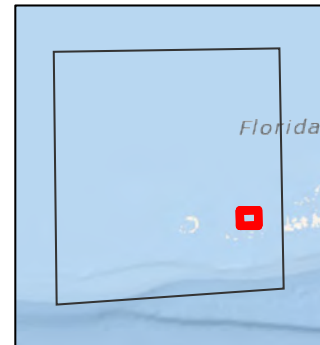
Little Mullet Key WMA decreases disturbance of nesting, roosting, and foraging birds. Shallow seagrass flats around the island exhibit light prop scarring.

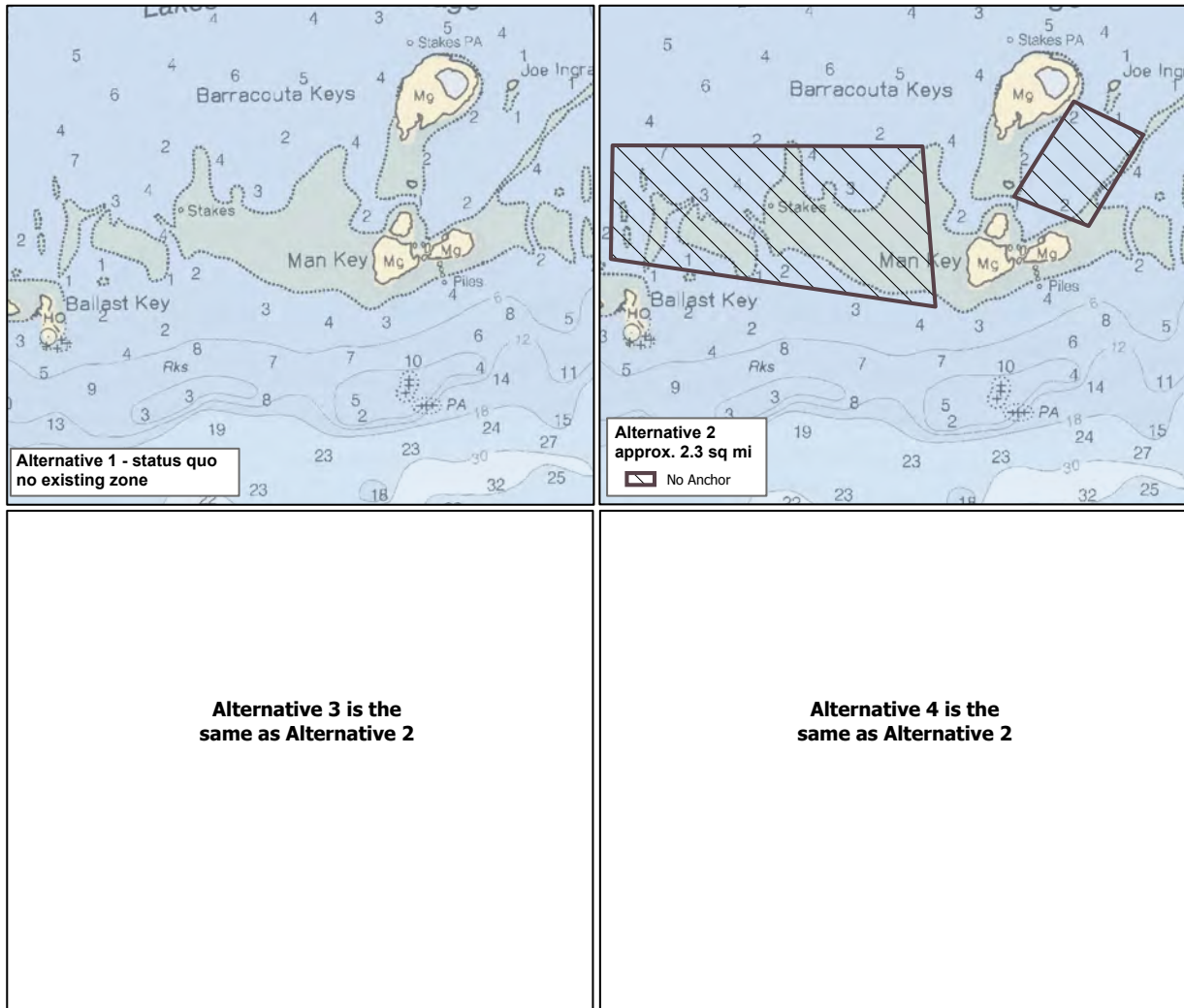
Big Mullet Key WMA decreases disturbance of nesting birds, including great white heron, a variety of other wading birds, and mangrove terrapins. Some of the shallow seagrass flats around the island exhibit light prop scarring.

Cottrell Key WMA decreases disturbance of wading birds and mangrove terrapins. This is the only island in the Lower Keys and Marquesas regions where brown pelicans nest. Shallow seagrass flats around the island exhibit light prop scarring.

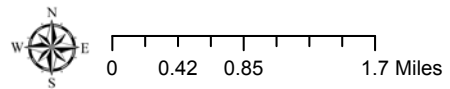
This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

Marquesas Region



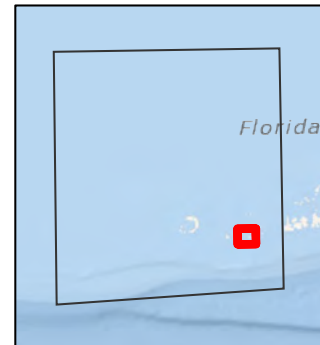


East Barracouta Key Flats and West Barracouta Key Flats Wildlife Management Areas

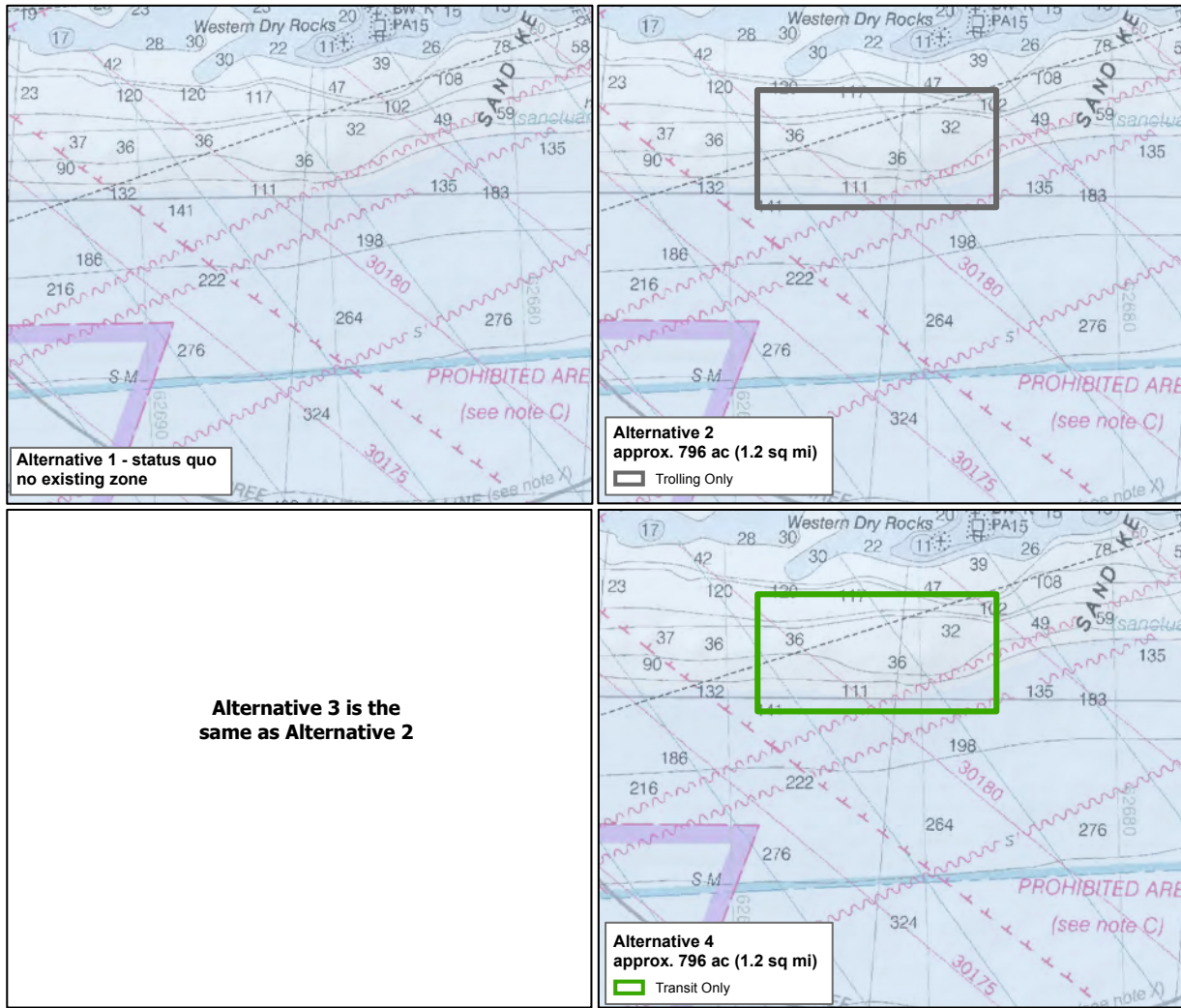


East Barracouta Key Flats WMA and West Barracouta Key Flats WMA decrease disturbance to ESA-listed sea turtles and protect important hardbottom habitat. Shallow seagrass flats in the area exhibit light prop scarring.

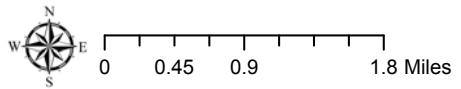
Marquesas Region



This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

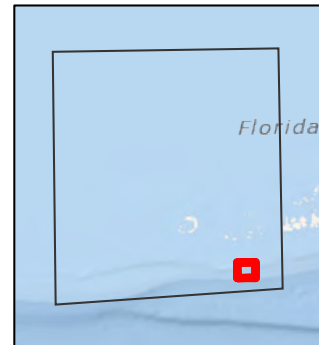


Western Dry Rocks Wildlife Management Area / Conservation Area

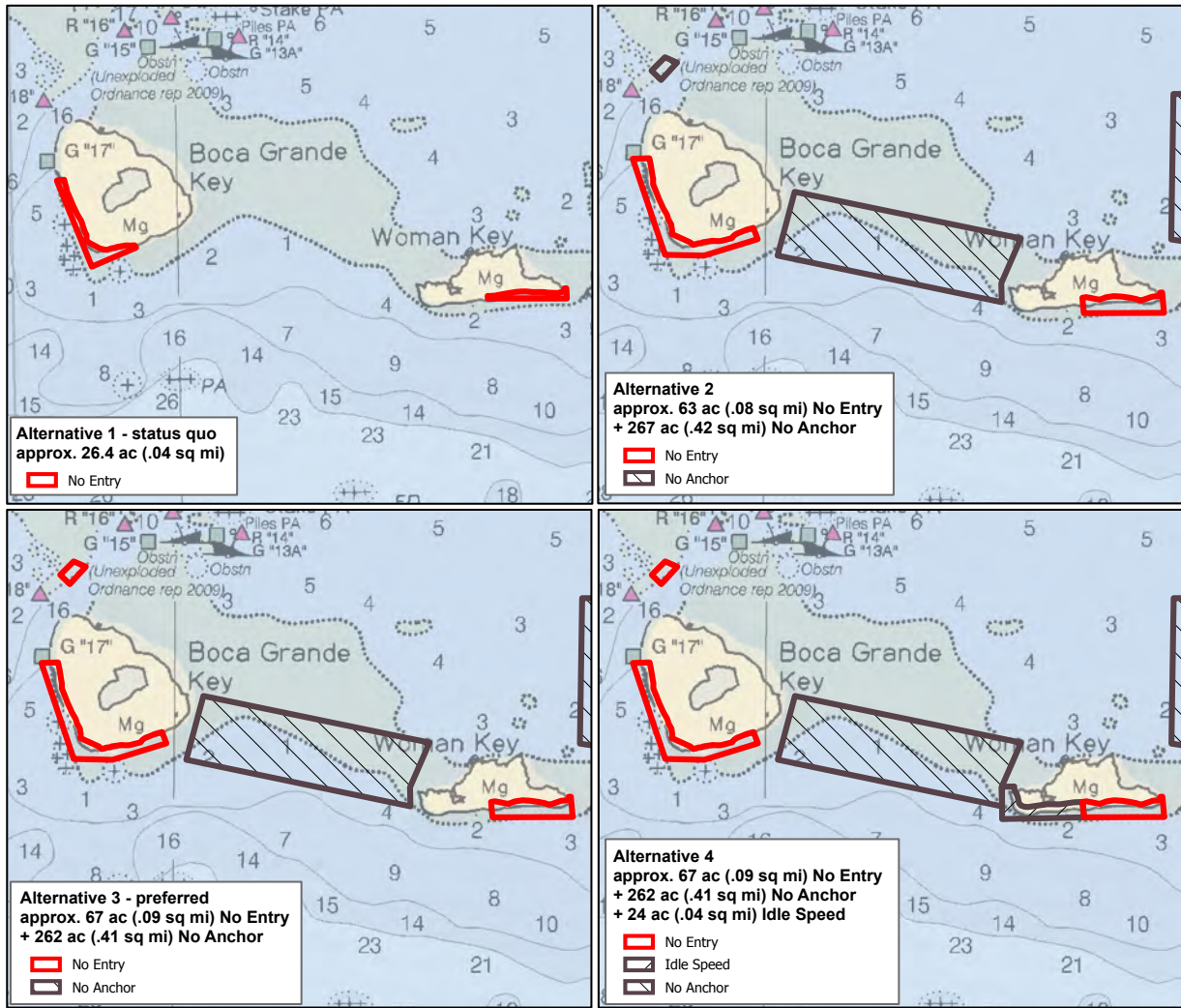


Protects an area of well-developed continuous reef, both inshore and deep reef areas with high coral cover and diversity. This area has ecological significance for supporting multi-fish spawning aggregations.

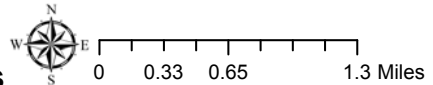
Marquesas Region



This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.



Woman Key, Boca Grande Key, Wilma Key, and Boca Grande to Woman Key Shallow Bank WMAs



Boca Grande Key WMA decreases disturbance of nesting and roosting birds. The island closure protects ESA-listed nesting sea turtle beaches and sensitive habitat including habitat for the ESA-listed Miami blue butterfly. Sea turtle nesting beaches may be impacted by high concentrations of visitors. Shallow seagrass flats around the island exhibit light-to-moderate prop scarring.

Boca Grande Woman Key Flat WMA decreases disturbance of nesting and roosting birds and to shallow water habitats including seagrass and hardbottom. Limit user conflict in a high traffic area.

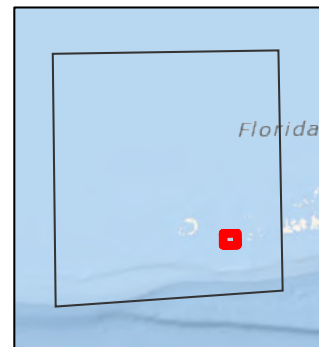
Woman Key WMA decreases disturbance of nesting and roosting birds. Decreases disturbance of ESA-listed nesting turtles, which may be impacted by high concentrations of visitors. Shallow seagrass flats around island exhibit light prop scarring.

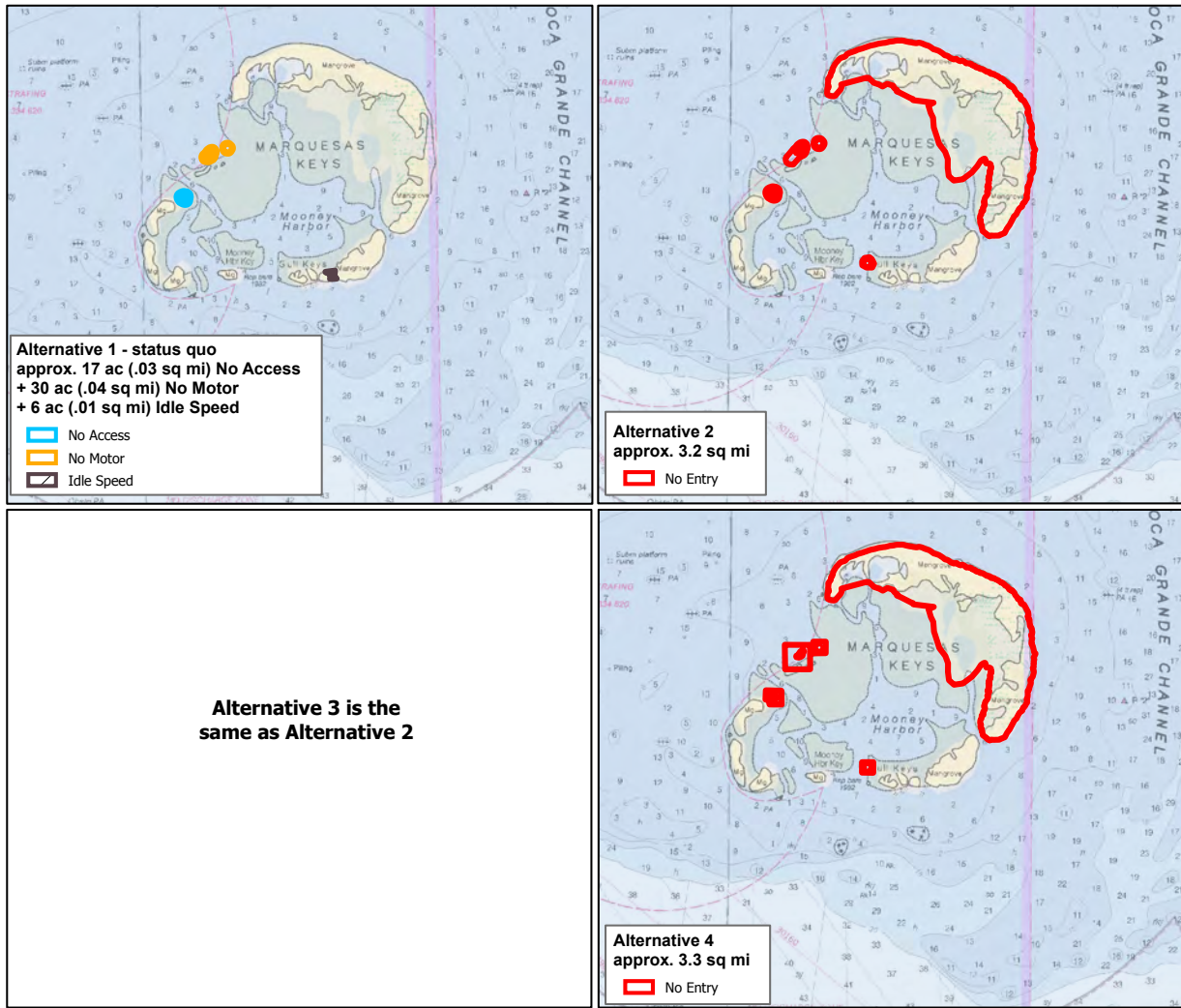
Wilma Key WMA decreases disturbance of nesting and roosting birds. Decreases disturbance of ESA-listed sea turtle nesting beaches that may be impacted by high concentrations of visitors. Shallow seagrass flats around the island exhibit light-to-moderate prop scarring.

This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time.

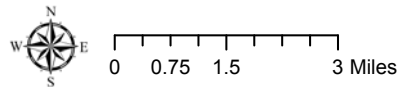
For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

Marquesas Region

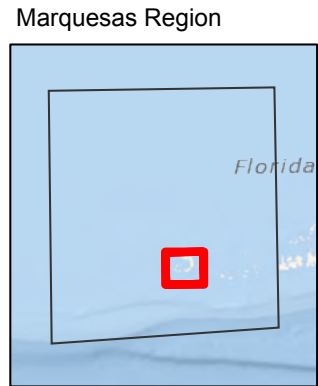




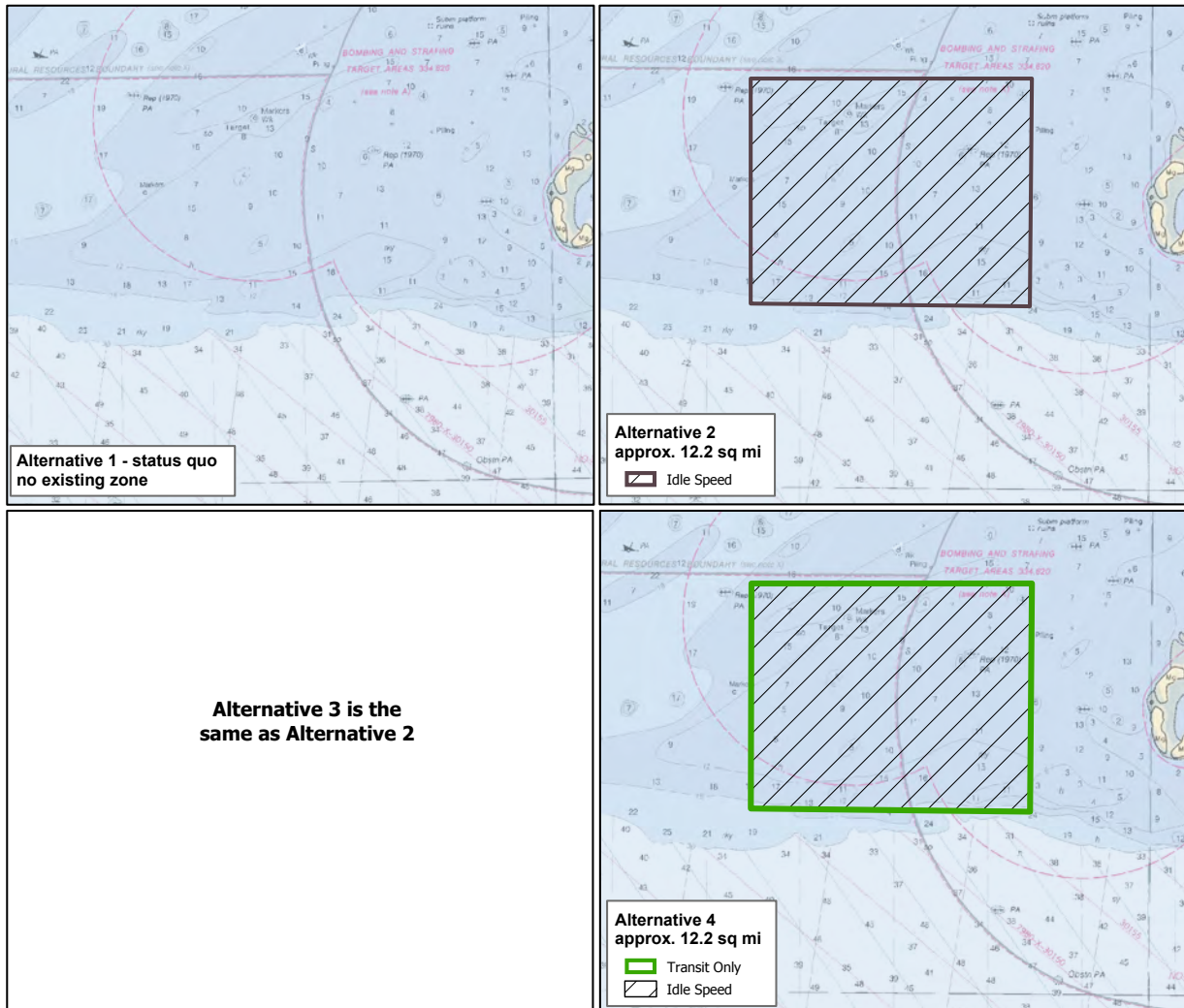
Marquesas Keys Wildlife Management Area



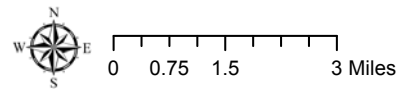
Decreases disturbance of nesting, feeding, and roosting birds and ESA-listed sea turtles. Shallow seagrass flats around the islands exhibit light prop scarring.



This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

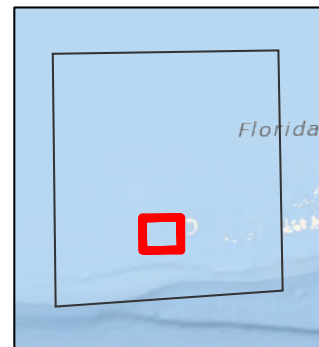


**Marquesas Keys Turtle Wildlife Management Area/
Conservation Area**



Decreases disturbance to ESA-listed green sea turtles on a rare, internationally-important foraging ground. Protects seagrass habitat.

Marquesas Region

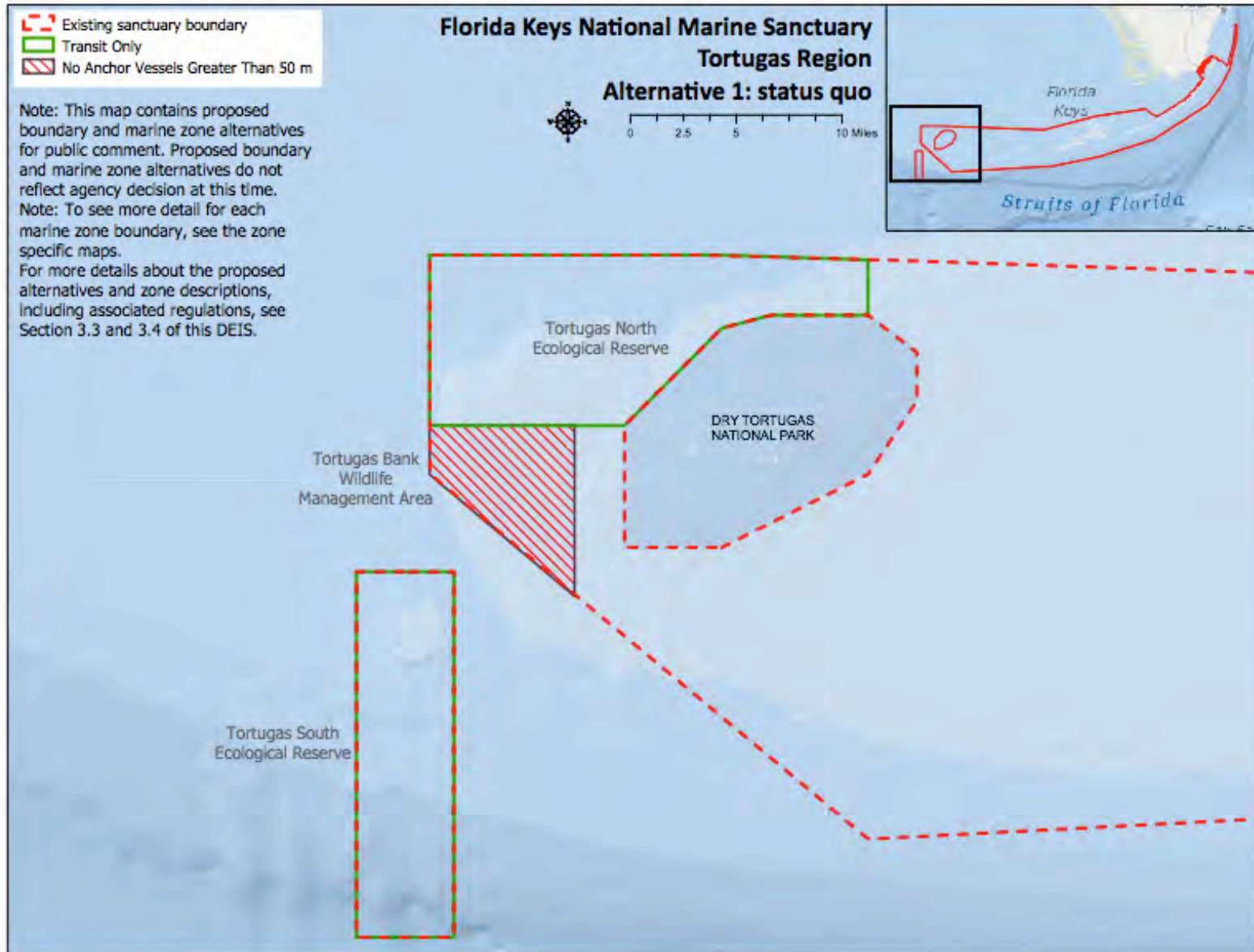


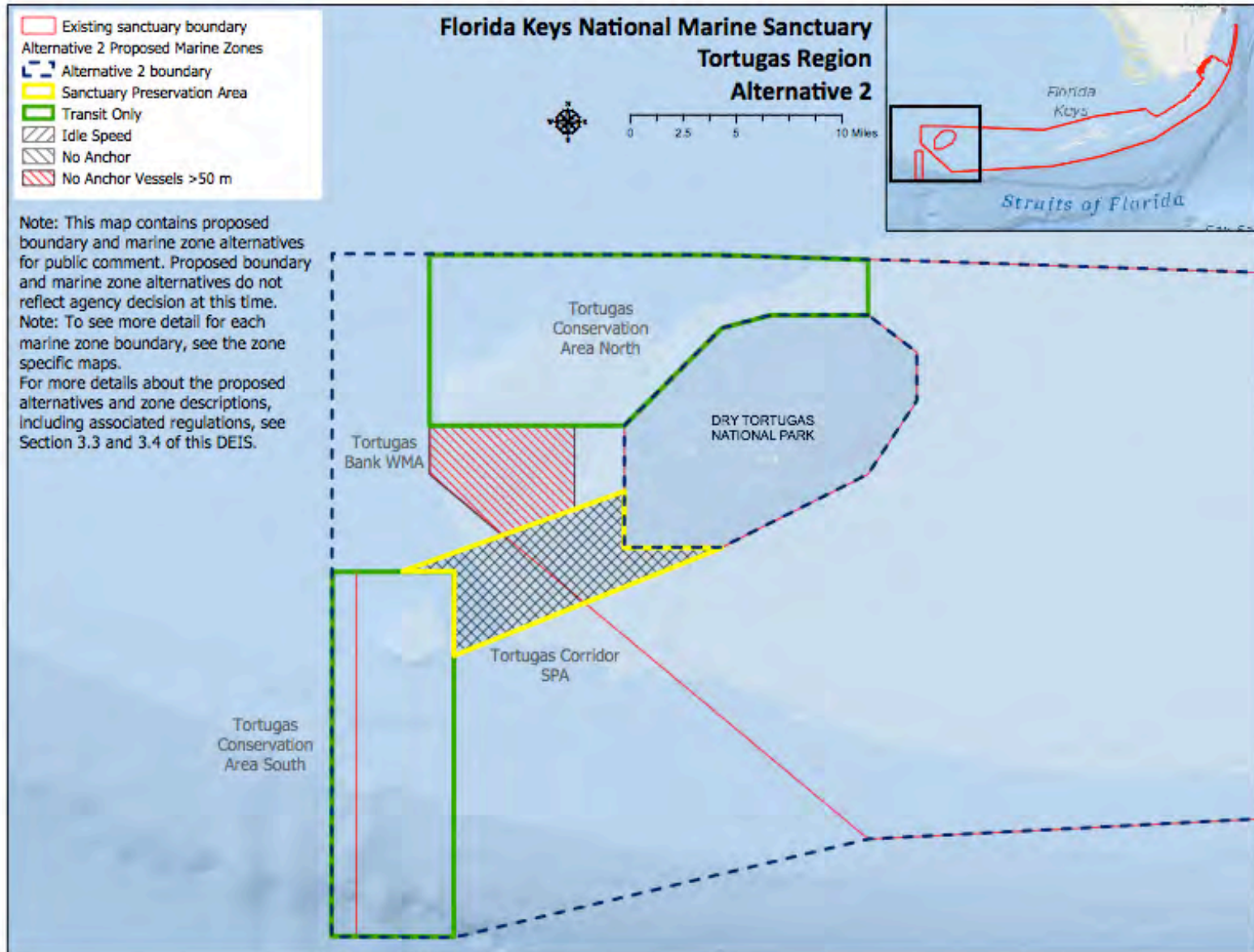
This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

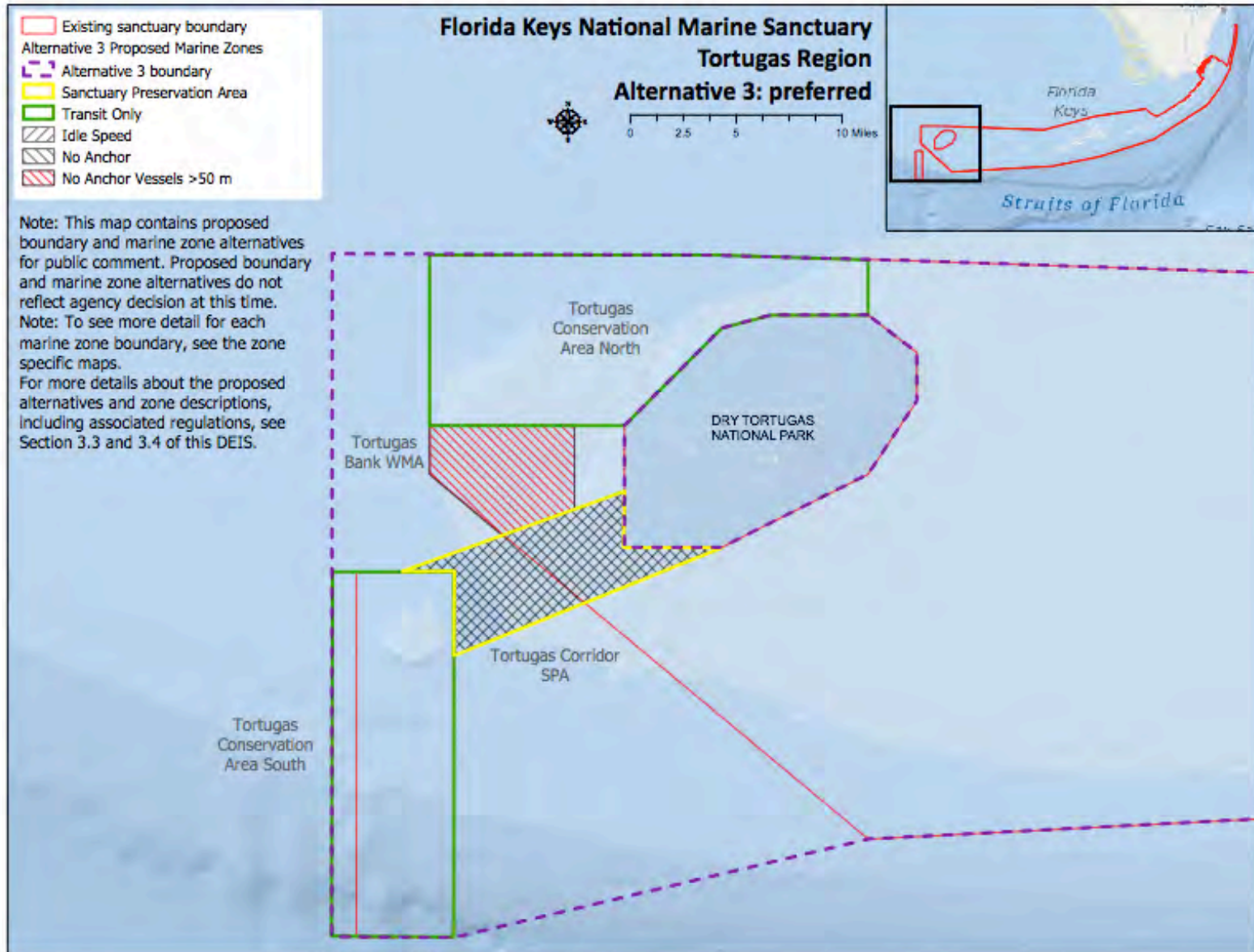
3.6.6 Tortugas Region and Tortugas marine zone alternatives

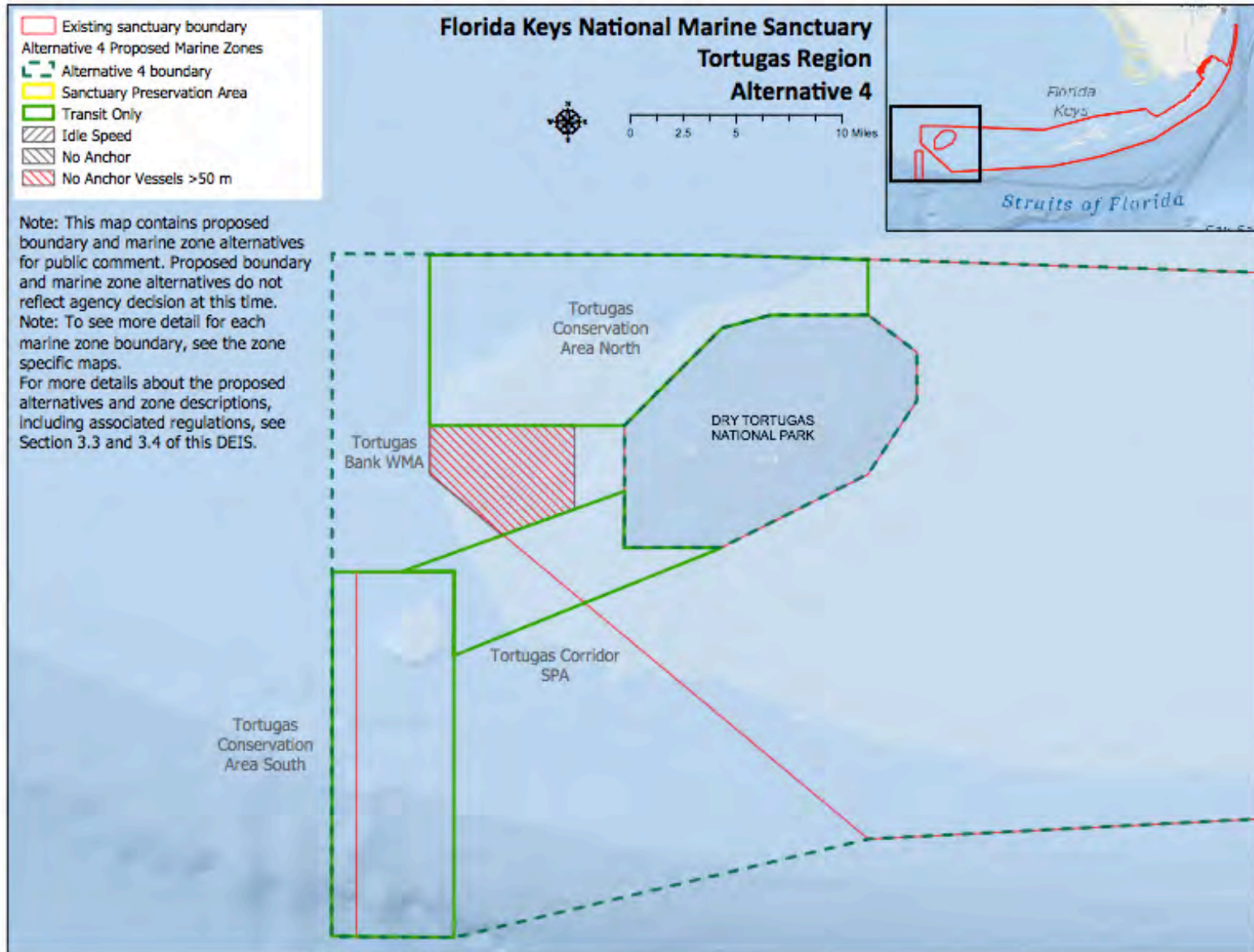


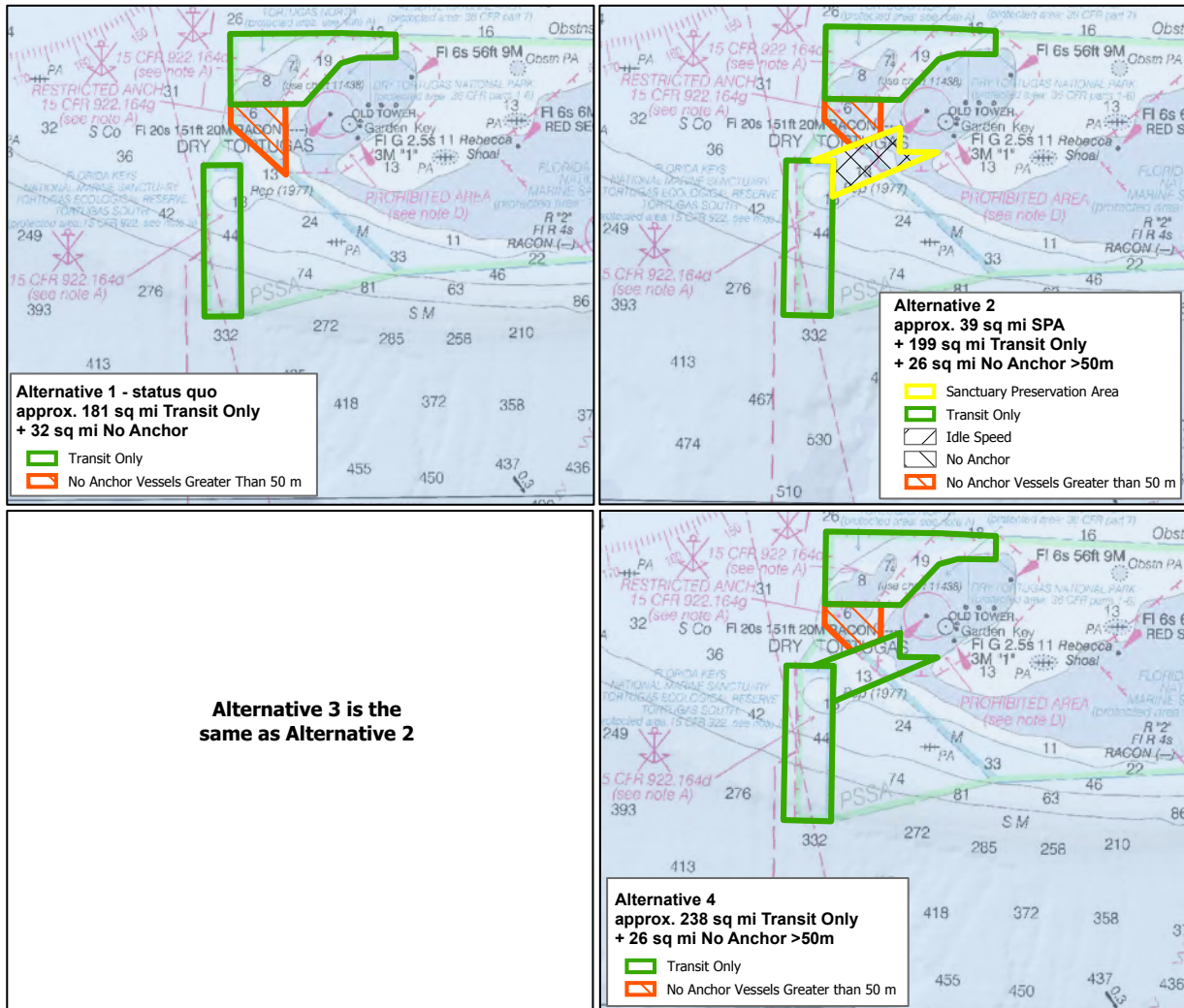
Spectacular marine life, minimally affected by disease and human impacts, inhabits the Tortugas Ecological Reserve North. Photo: Greg McFall/NOAA



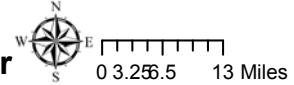








Tortugas Ecological Reserve North, Tortugas Ecological Reserve South, Tortugas Bank WMA, and Tortugas Corridor

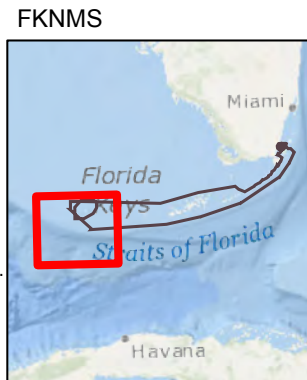


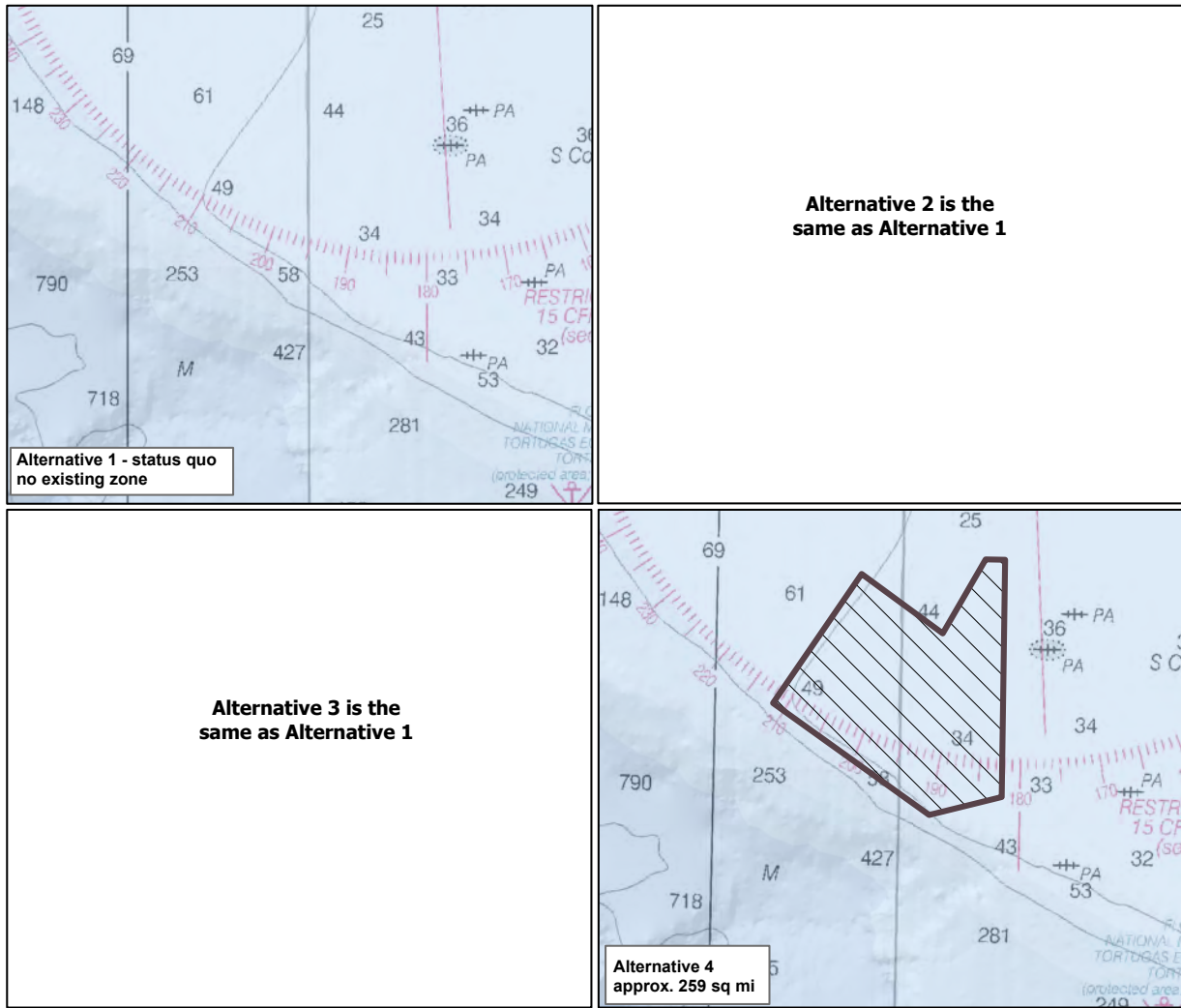
The Dry Tortugas Banks contain highly-diverse seagrass beds, shallow coral reef habitats, hardbottom areas, deep reef areas, and pinnacles that connect inshore juvenile fish habitats to offshore adult spawning areas. The Dry Tortugas support the largest remaining thickets of ESA-listed elkhorn coral and staghorn coral as well as high cover of deep water star corals. This site, with the Dry Tortugas National Park Research Natural Area, protects an ecologically-diverse seascape that connects inshore juvenile fish habitats to offshore adult spawning areas.

Tortugas South protects an area with high species and habitat diversity and abundance, and a known multi-fish spawning aggregation site. Protects important, unique deep water pinnacles and benthic habitat including Riley's Hump and deep reef habitats.

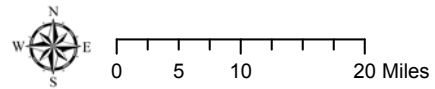
Tortugas Corridor protects a known fish spawning corridor between Tortugas Ecological Reserve South and Dry Tortugas National Park that connects important spawning, nursery, juvenile, and adult fish habitat needed to sustain large populations of commercially and ecologically important fish and invertebrate species. This supports the advisory council goal to protect large, contiguous, diverse habitat including natural spawning, nursery, and permanent residence areas needed for sustainable populations of fish and other marine life.

Tortugas Bank WMA protects Tortugas Bank from anchor damage.



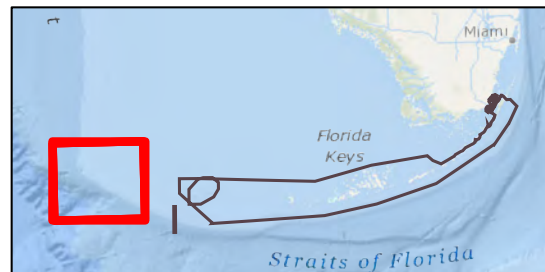


Pulley Ridge No Anchor Zone



Protects nationally-significant mesophotic reef ecosystems with demonstrated connectivity to the Florida Keys. This area also includes endemic species. This zone overlaps with an existing Gulf of Mexico Fishery Management Council Habitat Area of Particular Concern.

FKNMS



This map contains proposed marine zone alternatives for public comment. Proposed marine zone alternatives do not reflect agency decision at this time. For more details about the proposed alternatives and zone descriptions, including associated regulations, see Section 3.3 and 3.4 of this DEIS.

3.7 Alternatives considered and eliminated

Numerous boundary, marine zone, and regulatory alternatives were suggested during the scoping process and a range of potentially reasonable alternatives were considered. Alternatives considered but eliminated are described below. These alternatives were proposed by the public, Sanctuary Advisory Council members, established working groups, and/or agency staff. These alternatives were eliminated from consideration at this time for various reasons, including lack of relevance to the purpose and need, inability to address the particular issue within the scope of existing authority, or the need for more analysis beyond the scope of this management plan review process (see introduction to this chapter for the specific screening criteria NOAA used to consider and analyze alternatives for this DEIS). For these reasons, the below boundary, marine zone, and regulatory alternatives were carefully considered but eliminated from further consideration as the agency focused on alternatives that best achieve the purpose and need of the proposed action and goals, principles, and objectives outlined by the Sanctuary Advisory Council in their 2012 Florida Keys National Marine Sanctuary Advisory Council Regulatory and Zoning Alternatives Development Workplan.

3.7.1 Boundary

Study area boundary expansion in Florida Bay and Gulf of Mexico

At the December 2012 Sanctuary Advisory Council meeting, the council established the “study area,” which is the area that could be considered for potential boundary, regulatory, and marine zone updates through this review. The advisory council recommended including an area of Florida Bay between the existing sanctuary boundary and Everglades National Park extending to Cape Sable, and a larger area of the Gulf of Mexico north of the existing sanctuary boundary (see Figure 3.3).

The Florida Bay and Gulf of Mexico portions of the study area was considered and eliminated from further review for several reasons, primarily that alternatives should maximize environmental benefits while avoiding unnecessary adverse socioeconomic impacts, and should allow for the incorporation and consideration of recent or best available data and scientific knowledge. Information about the status and trends of habitats and species in this area is less well known than those in the existing and proposed sanctuary expansion boundary area. Therefore, it was not clear that through boundary expansion the environmental benefits of protection would avoid unnecessary and adverse socioeconomic impacts to existing users. Specific to the Gulf of Mexico study area, at the time of this management plan review, it was determined that sanctuary boundary expansion to this area was beyond the scope of the goals, principles, and objectives of the advisory council and the purpose and need of this DEIS. In addition, at this time NOAA determined that expansion to include these areas would place an unnecessary additional administrative and management burden, which could impact management of the existing sanctuary and proposed boundary expansion area. NOAA determined that boundary expansion in the Florida Bay and Gulf of Mexico portions of the study area would not be evaluated as part of this DEIS.

Boundary expansion to include the Ten Thousand Islands

NOAA received a request to consider boundary expansion to include the Ten Thousand Islands chain of mangrove islands between Marco Island and Lostmans River. Inclusion of this additional area in the sanctuary was considered and eliminated from further review for several reasons, primarily that alternatives must be feasible, enforceable, and aim to facilitate compliance. The Ten Thousand Islands are a distinct area at a distance of approximately 63 miles from the existing sanctuary boundary. In addition,

this area is managed by the U.S. Department of the Interior by the Everglades National Park and the Ten Thousand Islands National Wildlife Refuge. At the time of this management plan review, it was determined that additional sanctuary management would be duplicative of these other management regimes and would place an unnecessary additional administrative and management burden on NOAA, which could impact management of the existing sanctuary and proposed boundary expansion area. NOAA determined that boundary expansion in the Ten Thousand Islands area would not be evaluated as part of this DEIS.

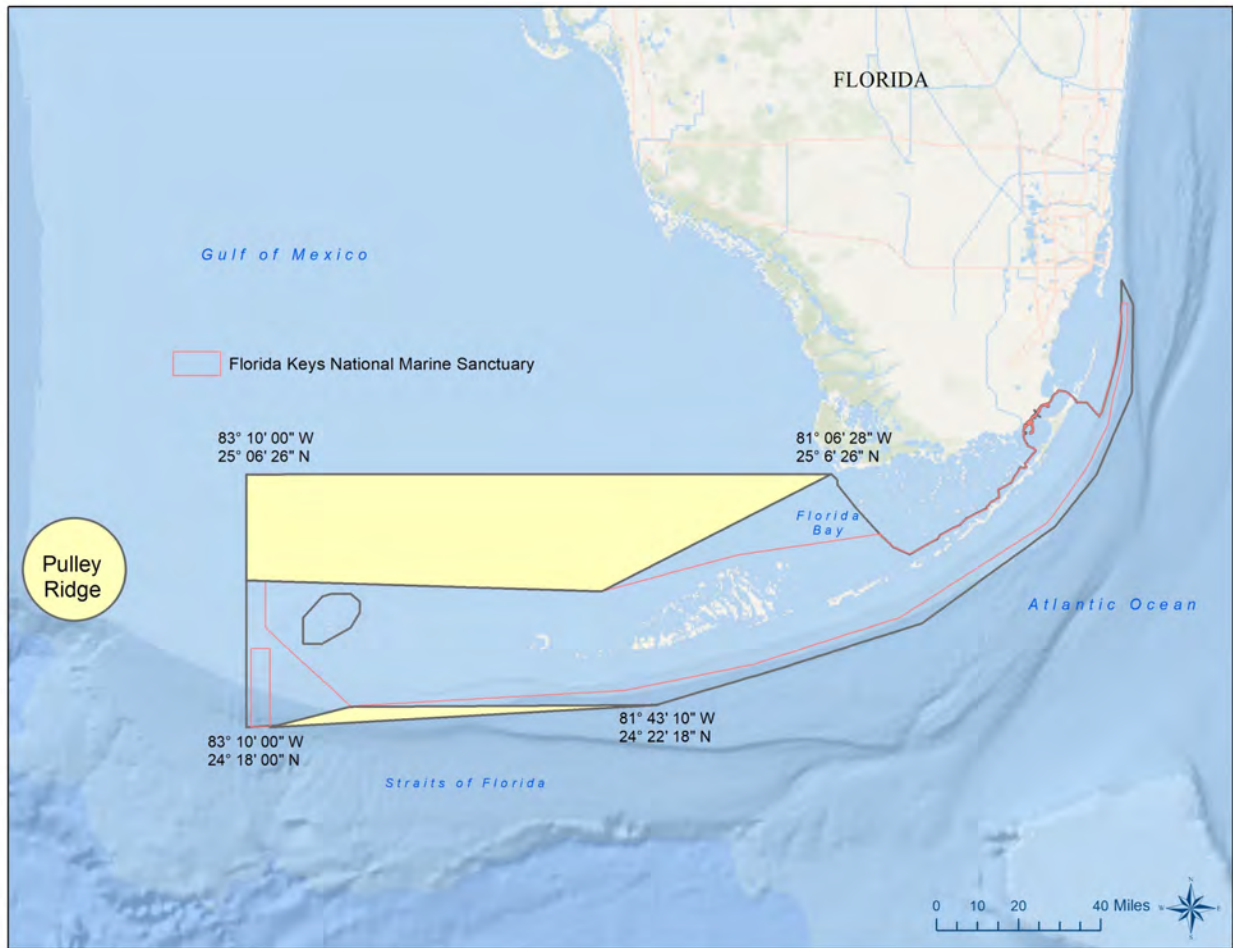


Figure 3.3. Sanctuary Advisory Council study area map. Image: NOAA

3.7.2 Sanctuary-wide regulations

User fees

The Sanctuary Advisory Council discussed the concept of implementing user fees for access to the sanctuary. A small user fee working group was established to examine how user fees would be implemented in the sanctuary, identify potential sources of funds and an estimate of funds that could be generated, determine how funds generated would be allocated and for what purpose/project, and consider how a user fee program could be enforced. The coral reef ecosystem restoration working group and shallow water wildlife and habitat protection working group also considered the need for innovative funding opportunities to fund coral and seagrass restoration activities.

NOAA considered development of a user fee program but ultimately eliminated it from further review for several reasons, primarily that alternatives must be feasible, enforceable, and aim to facilitate compliance. At this time, with current technology and the large number of access points (U.S. Highway 1, individual homes, boat ramps, marinas, etc.) to the sanctuary, it is not feasible to control access to manage and ensure compliance with collection of user fees. Many challenges to implementing, managing and enforcing a user fee program were identified, including administrative challenges: who would collect the user fee; where and how would the user fees be collected; how would such a program be administered and managed; and how would enforcement be implemented related to collection of user fees and controlling access to the sanctuary. While user fees are successfully implemented at adjacent public lands (national and state parks), at this time NOAA determined that the challenges were greater than the potential benefit gained from a user fee program, and therefore would not be evaluated as part of this DEIS.

Mandatory boater education

The Sanctuary Advisory Council discussed the need for enhanced boater education at several meetings in advance of and throughout this review process. The shallow water wildlife and habitat working group also explored options to enhance boater education, ultimately recommending a volunteer boater education program modeled after the Eco-Mariner program implemented in Everglades National Park. With recent changes in the Everglades National Park management plan to include an online mandatory boater education requirement, the advisory council requested that mandatory boater education be considered in FKNMS.

NOAA considered a mandatory boater education requirement but ultimately eliminated it from further review for a variety of reasons. As discussed previously, the sanctuary, unlike Everglades National Park, has a high number of access points (individual homes, boat ramps, marinas, etc.) and does not require permits for access, making it more challenging to ensure user compliance with and enforcement of a mandatory boater education requirement. In addition, alternatives should, where appropriate, increase consistency of regulations with state regulations. The state of Florida has existing laws that requires anyone who was born on or after January 1, 1988, to successfully complete an approved boating safety course and obtain a boating safety identification card (Florida Statutes section 327.395). For these reasons, NOAA determined that, at this time, mandatory boater education would not be evaluated as part of this DEIS.

However, NOAA acknowledges that enhanced boater education is needed and is committed to working with other agency partners, the state, and the advisory council to develop and implement a more robust boater education program within the sanctuary (see Section 3.5 for more details). In April 2019, FKNMS developed and launched a voluntary online boater education course in partnership with Indiana University's Eppley Institute for Parks and Public Lands. This effort was funded through a FKNMS WQPP special studies grant administered by the EPA. FKNMS plans to evaluate implementation of this voluntary boater education course, including numbers of users taking the course, knowledge of users before and after taking the course, and shifts in behavior that may result in decreasing vessel impacts. FKNMS would use this information to consider the need and implement options for a mandatory boater education requirement.

Fish feeding from shore-based operations

The Sanctuary Advisory Council requested that NOAA clarify the existing discharge prohibition to address fish feeding from land-based activities, divers, vessels for hire, and in general, except during fishing (see advisory council Resolution Addressing Permit Procedure and Adaptive Management for Analysis in a DEIS, October 21, 2014). NOAA considered this request and has proposed a fish feeding regulation that addresses fish feeding from divers and vessels for hire that strengthens an existing state regulation (see Section 3.2 for more details). NOAA considered prohibiting fish feeding from land-based activities but ultimately eliminated it from further review for a variety of reasons, primarily that alternatives should aim to facilitate compliance and maximize environmental benefits while avoiding unnecessary adverse socioeconomic impacts. Due to the large number of shore-based fish feeding venues, most small-scale, coin operated operations with a handful of larger-scale operations at points throughout the sanctuary, it would be difficult to control this activity to manage and ensure compliance. In addition, NOAA determined that fish feeding from land-based activities is not a current enforcement priority. NOAA determined that, at this time, these challenges were greater than the potential benefit gained from prohibiting fish feeding from land based activities, and therefore would not be evaluated as part of this DEIS.

Sanctuary-wide anchoring prohibition

NOAA considered including a sanctuary-wide anchoring prohibition to target a direct and local impact known to affect sanctuary resources and address concerns regarding the threats to the marine environment from anchor impacts and damage. Anchoring has been documented to cause reduced fish density and richness; and coral cover, size, density, and species richness; and reef structural complexity (Flynn 2015). Through managing local impacts, FKNMS aims to increase resilience of the ecosystem to better withstand regional and global impacts that NOAA cannot or does not have the authority to regulate or manage. In addition, decreased incidence of anchor damage may facilitate recovery of sanctuary resources. Such a sanctuary-wide anchoring prohibition would have built-on and strengthened existing restrictions on anchoring on living coral, 15 C.F.R. § 922.163(a)(5)(ii), and in ERs and SPAs, 15 C.F.R. § 922.164(d)(10)(v).

However, NOAA ultimately eliminated it from further review for a variety of reasons, primarily that alternatives should aim to facilitate compliance and maximize environmental benefits while avoiding unnecessary adverse socioeconomic impacts. While any anchoring prohibition would have identified specific habitat types where anchoring would be restricted, NOAA identified many challenges to implementing, managing, and enforcing such a prohibition. In addition, such a regulation would likely require placement of a large number of new mooring buoys, which is likely to have minimal adverse impact on the benthic habitats where mooring buoy hardware would be placed. NOAA determined that these challenges were greater than the potential benefit gained from a sanctuary-wide anchor prohibition, and therefore would not be evaluated as part of this DEIS.

Through this DEIS, NOAA is proposing additional no anchor regulations in Key Largo and Looe Key management areas and in all SPAs. If implemented, NOAA will evaluate the environmental benefits and impacts to access of no anchor regulations to determine if there is value in expanding no anchor regulations to additional areas of the sanctuary.

Live rock aquaculture prohibition

NOAA considered updating the live rock prohibition by removing the exemption for permitted live rock aquaculture activities in FKNMS and eliminating existing operations over time. NOAA would have required that existing aquaculture activities permitted by the state of Florida and NMFS cease within five years of the effective date of final regulations and that all aquaculture materials be removed from state and federally permitted sites within the sanctuary. Removing the exemption for permitted live rock aquaculture activities from FKNMS regulations and phasing out existing sites could provide NOAA with greater ability to address activities that complicate enforcement and/or lead to illegal poaching of wild corals and wild live rock. It could also result in direct and indirect benefit to sanctuary resources, particularly habitats and wildlife in the vicinity of live rock aquaculture areas.

However, NOAA ultimately eliminated it from further review for a variety of reasons, primarily that alternatives should maximize environmental benefits while avoiding unnecessary adverse socioeconomic impacts. While socioeconomic data on landings in the live rock aquaculture fishery are known, the extent to which business operations that currently have active permits depend on live rock aquaculture for all or part of their livelihood is not fully known. The level of activity at permitted sites is also not known, so it is unclear whether an outright prohibition on live rock aquaculture at this time would better protect sanctuary resources than the alternatives being put forward. However, NOAA plans to gather additional information about live rock aquaculture operations in the sanctuary, including examining the extent to which such activities may complicate enforcement of illegal poaching of wild live rock and wild corals. NOAA will also evaluate existing operations to determine if modifications to the fishery resulting from this environmental review process are sufficient to protect sanctuary resources. NOAA would use this information to consider whether removing the exemption for permitted live rock aquaculture activities in FKNMS is warranted in the future.

3.7.3 Marine zones and associated regulations

The Sanctuary Advisory Council established three community working groups to review and provide options for updating the sanctuary marine zoning scheme. Several marine zone recommendations were considered but eliminated from further analysis.

“Area to be avoided” changes in Tortugas Region

The ecosystem protection: ecological reserves, preservation areas, and wildlife protection working group considered potential expansion of the existing ATBA in the Tortugas Region of the sanctuary. The ATBA was designated through the FKNMSPA in 1990, approved by the IMO in 1991, and codified in sanctuary regulations in 1997 at 15 C.F.R. § 922.164(a). Changes to the ATBA in the Tortugas Region were considered and eliminated from further review for several reasons, primarily that alternatives should maximize environmental benefits while avoiding unnecessary adverse socioeconomic impacts.

Designation of the ATBA in the Tortugas Region was determined based on the potential for environmental impact by large vessels. Modification of the ATBA in the Tortugas Region would not provide significant additional environmental benefits without avoiding unnecessary and adverse socioeconomic impacts. In addition, any change to the ATBA would require coordination across several agencies and internationally with the IMO. NOAA determined that modification of the ATBA in the Tortugas Region would not be evaluated as part of this DEIS.

Temporal marine zones in the backcountry region

The Shallow water wildlife and habitat protection working group considered applying a temporal zoning option for many of the marine zones considered for the national wildlife refuges and areas managed through the backcountry management plan. The temporal zoning option included no access and no entry buffer areas extending 100-yards around islands when species of concern are present, such as nesting, roosting, or foraging bird species, nesting or foraging turtles, and other sensitive wildlife. While temporal zoning may provide more targeted, species-specific, and time-limited management, temporal marine zones were ultimately eliminated from further review for several reasons, primarily that alternatives must be feasible and enforceable and aim to facilitate compliance. NOAA and USFWS determined that temporal marine zones were not feasible due, in part, to the need for continual placement and removal of marker buoys at each zone for each temporal zoning period; the administrative burden to coordinate marker buoy permitting and placement among the various agencies with authority over aids to navigation (e.g., Monroe County, FWC, USCG, Army Corps of Engineers, etc.); and the resource implications for funding and staff to manage such a program. NOAA and USFWS determined that temporal marine zones would not facilitate compliance and were not fully enforceable due to the ongoing need to update and notify the public regarding updates to marine zone temporal closure regulations. In addition, NOAA and USFWS considered how temporal zone alternatives address resource management issues, generate beneficial environmental effects, and address uses or other activities that have an adverse effect on sanctuary resources. In doing so, NOAA and USFWS determined that if an area was of value for a particular species during a portion of their life cycle, then protecting that area year-round would be necessary to ensure the long-term and continued use of that area by species of concern. NOAA and USFWS determined that temporal marine zones would not be evaluated as part of this DEIS at this time.

Tarpon migration zone

The shallow water wildlife and habitat protection working group considered several marine areas for zoning to protect tarpon during their migration in the Florida Keys. Two areas discussed by the working group, Seaplane Basin and Tarpon Wildlife Migration Lane, were considered but eliminated from further review for several reasons, primarily that alternatives should aim to facilitate compliance and must be consistent with the purposes and policies of the NMSA and FKNMSPA. The areas identified for potential closure are large, multi-use, and, due to the large size and year-round multi-use of the area proposed, would present compliance and enforcement challenges. In addition, it is not clear that the closure of these areas would meet the stated purpose in the FKNMSPA to protect the resources of the sanctuary while not restricting activities that do not cause an adverse effect to sanctuary resources. At this time, NOAA determined that these two marine zones would not be evaluated as part of this DEIS.

Motorized personal watercraft

Several motorized personal watercraft alternatives were considered based on public comment and direction from the 2007 FKNMS revised management plan. The following three alternatives were considered but eliminated from further review:

1. *Prohibit personal watercraft throughout the sanctuary.*
2. *Ban the operation of all vessels in less than two feet of water in the sanctuary.*
3. *Establish a 400-yard, point-to-point travel corridor from shorelines to designated high-speed rental-riding areas.*

These alternatives were considered but eliminated from further review for several reasons. In general, alternatives should maximize environmental benefits while avoiding unnecessary adverse socioeconomic impacts and be consistent with the purposes and policies of the NMSA and FKNMSPA. Prohibiting the use of personal watercraft throughout the sanctuary and banning operation of all vessels in less than two feet of water would be difficult to enforce and would likely have potential for adverse socioeconomic impacts due to the high numbers of vessels including personal watercraft that are used in sanctuary waters. NOAA determined that these three motorized personal watercraft options would not be evaluated as part of this DEIS. However, to address some of the potential impacts from vessel and personal watercraft use in shallow and other nearshore waters, NOAA is proposing to update the existing sanctuary-wide idle speed/no wake within 100 yards of residential shorelines to be slow speed and apply to all shorelines (see Section 3.2.3 for details).

CHAPTER 4

AFFECTED ENVIRONMENT

4.1 Introduction

This chapter provides detailed information on the biological, physical, historical, and economic resources affected by the proposed action and alternatives presented in Chapter 3. This chapter includes a site description and an overview of the baseline resource conditions within the study area of the proposed action (i.e., the potentially affected area for a particular resource).

This chapter is organized by sections on each resource area or type of use that may be impacted by the proposed action or alternatives, as follows:

- Biological resources
- Physical resources
- Pulley Ridge Unit and associated resources
- Cultural and historical resources
- Socioeconomic resources and human uses

Each section includes a discussion of the general conditions of the resource or use within the study area. The study area varies by topic, but is generally inclusive of the existing sanctuary and national wildlife refuges boundaries, the ATBA, Florida Bay, and Pulley Ridge (Figure 4.1). Appendix D gives an overview of federal regulations and federal and local jurisdictions and agreements that apply to the study area.

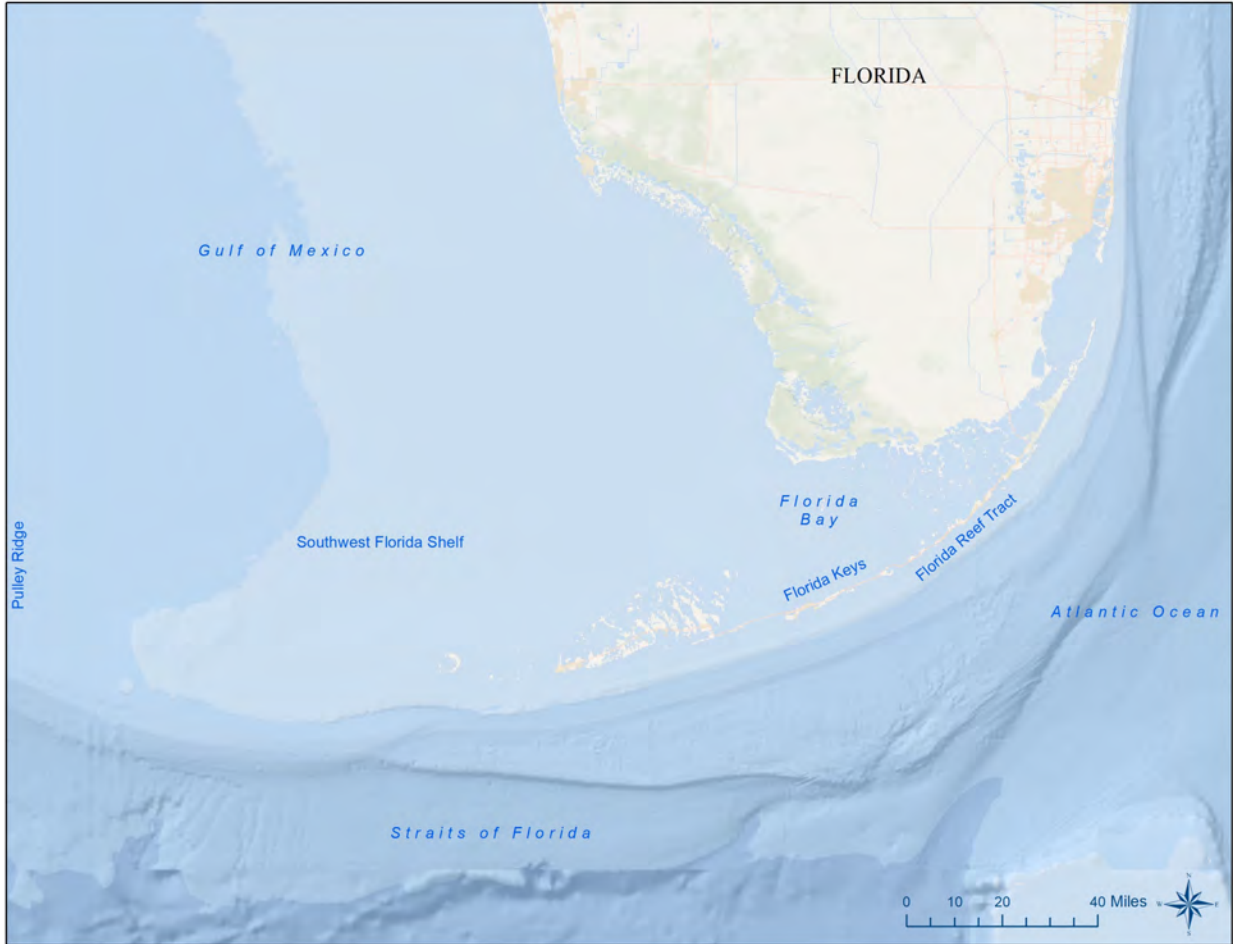


Figure 4.1. Florida Keys National Marine Sanctuary study area: The South Florida regional ecosystem includes interconnected natural resources and physical features. Image: NOAA

Since the proposed action includes a series of separate alternatives and regulatory actions that may not equally affect all areas of the sanctuary or refuges, the focus of the affected environment description is on the resources or uses that may be affected by changes in the sanctuary boundaries, sanctuary-wide regulations, marine zone boundaries, or marine zone regulations. As a result, some sections, such as hydrology under physical resources, provide only a general discussion of the resource conditions, while others, such as the biological resources section, provide a more specific discussion of the resources. The nature of existing conditions in the affected area waters is interpreted from available literature and summarized in the resource sections.

Only the background environmental and socioeconomic conditions relevant to the proposed action or alternatives are presented. Resource areas that have been determined to have no potential for impacts by the proposed action or alternatives are not discussed in this DEIS. These include land use, utilities, and visual resources.

4.1.1 Study area

The study area contains components of six distinct physiographic regions: Florida Bay, the Southwest Continental Shelf, the Florida Reef Tract (portion to the south and west of Virginia Key), the Florida

Keys, the Straits of Florida, and Pulley Ridge. The regions are environmentally and geologically unique, and together form the framework for the sanctuary's diverse terrestrial and aquatic habitats.

Florida Bay

Roughly triangular in shape, Florida Bay is located at the base of the Florida peninsula and is bordered by the Everglades to the north, the Florida Keys to the east and south, and the Gulf of Mexico to the west (Hoffmeister 1974, Porter et. al. 2002). The bay covers approximately 849 square miles (2,200 square km) and is a system of shallow basins separated from one another by interconnected mud banks or shoals. Low-lying islands typically form on banks where mangrove colonization can result in sedimentation above the mean high tide (Enos 1977). Seagrass meadows cover extensive areas of the bay's banks and basins (Schomer and Drew 1982).

Due to the bay's shallow depth, large seasonal variations in temperature and salinity are common, and abundant sediment contributes to turbidity levels. Florida Bay and the offshore coral reefs of the Florida Keys are connected via seasonal variations and tides can carry water rich in nutrients and sediments through the Florida Keys passes and channels to the Florida Reef Tract (Ginsburg and Shinn 1964, Mineral Management Service 1990). In the Upper Keys, the nearly continuous barrier formed by the Florida Keys island chain separates the bay from the Straits of Florida and the Atlantic Ocean and shields the Florida Reef Tract on the ocean side from the environmentally variable bay waters.

Southwest Florida Shelf

The southwest Florida Shelf area is a marine environment that contains a variety of benthic habitats dependent on substrate type and light availability. Benthic habitats include seagrass beds along the shore and live bottom. Extensive seagrass beds of the small, fast-growing paddle grass (*Halophila decipiens*) are found in the deeper waters where sunlight is limited. Closer to shore where light is less limited and conditions are relatively stable, manatee grass (*Syringodium filiforme*) forms tall, dense beds.

Live bottom offshore habitats support abundant fish and attracts sea turtles. This habitat is characterized by assemblages of macroalgae and sessile invertebrates living on rocky formations, including hardbottom with stony corals (Scleractinia), gorgonians (Alcyonacea), macroalgae, sponges (Porifera) and other invertebrates. Pen shells (Pinnidae), calico scallops (*Argopecten gibbus*), fighting conchs (*Strombus pugilis*), and other mollusks are found in the shallow shelf areas, and barrel sponges (*Xestospongia muta*) are found in deeper depths. Pink shrimp (*Farfantepenaeus duorarum*), stone crab (*Menippe mercenaria*), red drum (*Sciaenops ocellatus*), and other commercially valuable species spend part of their life cycle on the shelf and depend on shelf habitats (Nuttall and Fletcher 2013).

Florida Keys Reef Tract

The Florida Keys Reef Tract is an arc-shaped band of living coral reefs located on the continental shelf between the islands of the Florida Keys and the deeper waters of the Straits of Florida. Approximately 81 miles (130 km) of bank reefs stretch from Fowey Rocks off Miami to Tortugas Bank west of Key West. This bank-barrier reef system is the third largest in the world and began growing about 6,000 years ago. Bank reefs exist in a high energy environment and absorb wave energy from storms and storm surges. The reef tract is approximately four miles (6.4 m) wide and features two discontinuous parallel ridges. The inner ridge is characterized by skeletal sands, scattered patch reefs, and grass beds, and is located seaward of Hawk Channel. The outer ridge is at the seaward edge of the reef tract and consists of a discontinuous shelf margin of reefs and hard banks composed of coral rubble and skeletal sand.

Patch reefs, which tend to be circular in shape, are found along the inner ridge, while outer reefs characterized by spur and groove formation are found on the shelf margin of the outer ridge. Approximately 6,000 patch reefs lie along the Florida Keys Reef Tract, with over 80 percent between northern Elliott Key and North Key Largo. Patch reefs are circular to oval in shape, 100 to 2300 feet (30-700 m) in diameter, and occur in water between six and 30 feet (2-9 m) deep in the low-energy environment nearshore of the outer bank reefs.

Corals and coral reefs in the Florida Keys depend on the Florida Current to bring the warm, low-nutrient waters that corals require to live. Reef development is generally considered to be the greatest in the northern Keys, where the long island of Key Largo prevents the influx of sediments and waters of variable conditions from Florida Bay and the Southwest Shelf and creates conditions conducive to reef growth. Thus, reefs are well developed seaward of the Upper Keys and Lower Keys, but are absent or poorly developed near the wider channels in the middle Keys, where conditions for optimal growth are adversely affected by water quality variations (Ginsburg and Shinn 1964, Voss 1988, Shinn et al. 1989). (See the biological resources section of this chapter for more detail on the reef environment.)

Florida Keys

The Florida Keys extend southwest from the southeastern part of the Florida peninsula over 220 miles (354 km) terminating at the islands of the Dry Tortugas. The Florida Keys can be divided into five areas based on morphology, lithology, and location: the Upper, Middle, and Lower Keys, the Marquesas, and the Dry Tortugas.

The Upper Keys extend from Virginia Key to Lower Matecumbe Key. The islands in the Upper Keys are long, narrow, and low-lying, with an average elevation of three to six feet (1-2 m) and a maximum elevation of 20 feet (6 m) at Windley Key (Minerals Management Service 1990). Only a few narrow channels connect Florida Bay to the Atlantic Ocean.

The Middle Keys extend from Lower Matecumbe Key to the Seven Mile Bridge. The Middle Keys are similar in size, elevation, and orientation to the Upper Keys; however, numerous wide channels separate each island.

The Lower Keys extend from Little Duck Key to Key West. The Lower Keys are broad, flat, are separated by long narrow channels, and turn perpendicular to the Middle and Upper Keys.

The Marquesas and Dry Tortugas regions are found to the west of the Lower Keys and are more recently-formed isolated clusters of carbonate sand shoals on the southern edge of the southwest continental shelf. Their continuing formation is dependent on sediment transported to the area and the growth of surrounding reef-building coral reefs (Multer 1977, Minerals Management Service 1990).

Straits of Florida

The Straits of Florida make up a large block-faulted basin paralleling the Florida Keys and the Florida Keys Reef Tract. The basin contains an open-ocean, deepwater environment. Its ocean floor slopes gradually for several kilometers to a depth of 984 feet (300 m) before dropping off sharply to an average depth of 2,624 feet (800 m). One of the Straits' most significant features is the Pourtales Terrace, a well-defined plateau (124 miles [200 km] long by 19 miles [30 km] wide and 656 to 1,312 feet [200-400 m] deep) that borders the Lower Keys (Multer 1977, Mineral Management Service 1990). The morphology of the Straits is controlled by the Florida Current, which links the Gulf of Mexico Loop Current with the

Gulf Stream. The warm, clear, low-nutrient waters of the Florida Current create the warm, stable conditions that make coral reef development possible at this more northerly latitude. The Florida Current and its eddies bring larvae spawned elsewhere in the Caribbean Basin and Dry Tortugas to the Florida Keys Reef Tract (Lee and Williams 1999).

Pulley Ridge

Pulley Ridge is a carbonate ridge that is 197 to 295 feet (60-90 m) deep. It extends nearly 186 miles (300 km) along the southwestern Florida Shelf in the northern Gulf of Mexico approximately 41 miles (66 km) west of the Dry Tortugas, and includes unique geomorphology and associated habitats. The southern portion of Pulley Ridge, at depths of 200 to 262 feet (60-80 m), supports the deepest known photosynthetic coral reef off the continental United States. The dominant communities in these reefs, also called mesophotic reefs due to their depth and reduced access to light for photosynthesis, are coralline algae and scleractinian corals. Mesophotic reefs create hardbottom habitat that supports a diverse community of plants and animals, many of which are unique and include coral, sponge, and algal species. Regional currents drive important physical connectivity between the coral reefs of Pulley Ridge, the Dry Tortugas, and the Florida Keys. (See Section 4.4 for more detail on the mesophotic reef environment and associated resources at Pulley Ridge.)

4.2 Biological resources

This section presents information on a variety of habitat types and associated biological communities, a summary of marine flora, and a discussion of specific wildlife resources including fishes, marine mammals, birds, invertebrates, and reptiles. This section also includes information on specific species that are protected by federal and/or state law.

The study area for biological resources includes the existing FKNMS, Florida Keys National Wildlife Refuges, and the areas in the Tortugas and Pulley Ridge that are included in potential boundary expansion alternatives.

Biological resources in the study area are described in many publications, and additional information is available from a variety of sources. Regular benthic monitoring provided valuable quantitative information beginning in 1994 about the overall condition of coral reefs, including trends in coral, macroalgae, and sponge cover and prevalence of bleaching and disease. The main, reef-wide programs include the Coral Reef Evaluation and Monitoring Program (CREMP) implemented by scientists with the FWC-FWRI, the Sanctuary Coral Reef Ecosystem Monitoring (SCREAM) program implemented by academic partners (which is now part of NOAA's National Coral Reef Monitoring Program), the FRRP coordinated by The Nature Conservancy, and the National Coral Reef Monitoring Program coordinated by NOAA's Coral Reef Conservation Program.

NOAA and USFWS staff gathered this information for existing and future management efforts, to monitor conservation objectives, and as part of ongoing resource assessment and research. For a more detailed discussion on biological resources within FKNMS, please refer to the following documents: Tortugas Integrated Assessment (Jeffrey et al. eds 2012) and Florida Keys National Marine Sanctuary Condition Report (NOAA 2011), as well as Tropical Connections (Kruczynski and Fletcher 2012), USFWS Lower Florida Keys Comprehensive Conservation Plan (2009), and USFWS Crocodile Lake National Wildlife Refuge Comprehensive Conservation Plan (2006). Appendix E of this DEIS contains

comprehensive lists of species known to occur in the study area that are protected under state and/or federal law, including species listed as threatened or endangered.

4.2.1 Habitats

The study area contains a diversity of habitats, including coral reefs, unconsolidated soft bottom habitats (e.g., sand and mudflats), colonized hardbottom habitats, submerged aquatic vegetation (e.g., seagrass and algae), mangrove, beach/dune, coastal berms, and beach ridge hammocks. The following discussion focuses on habitats in and adjacent to the study area.

4.2.1.1 Coral reef

The Florida Reef Tract is the most extensive living coral reef ecosystem in North American waters. It extends from the Dry Tortugas in the west to St. Lucie inlet off the southeast coast of peninsular Florida. Coral reefs are created by reef-building (stony) corals, calcareous marine algae, and other marine invertebrates that produce skeletons or structures made of calcium carbonate (CaCO₃, or limestone). The skeletons of corals and other marine life become cemented together to form a rigid, wave-resistant living structure elevated off the seafloor.

Within the tissue of most shallow-water reef-building corals live small microscopic algae called zooxanthellae. These algae produce energy and oxygen for the coral as byproducts of photosynthesis. Zooxanthellae also aid in calcium carbonate production by the coral colony, promoting the growth of coral skeletons.

Coral reefs are generally restricted to the tropics, where waters are warm, clear, low in nutrients such as nitrogen and phosphorus, and have stable temperature and salinity. The Florida Keys Reef Tract is one example in which the warm waters of the Florida Current and Gulf Stream expand the range of corals north of the tropics.

Coral reefs create important habitat for various organisms including both sessile and mobile invertebrates, as well as highly diverse reef fish. In turn, many of these animals provide food for predators that often visit reefs, such as sharks, pelagic fish, and dolphins (Cetacea). Over 45 species of stony corals, 35 soft corals and hundreds of other invertebrates such as sponges, anemones (Actiniaria), crustaceans (Arthropoda), molluscs (Mollusca) and echinoderms (Echinodermata) have been described from the Florida Keys with as many as 34 species of stony coral reported on individual coral reefs in the Florida Keys (Florida Natural Areas Inventory [FNAI] 2010). Coral reefs provide many ecosystem benefits to humans, supporting fisheries, tourism, and recreation. They also provide vital coastal shoreline services by protecting the coastline from wave action, storm surges, and even tsunamis (Cochard et al. 2008, Storlozzi et al. 2019).

Continuous reefs

The reef tract within FKNMS extends from the northern boundary of the sanctuary to west of the Marquesas Keys and is also found at the Dry Tortugas. The reef tract consists of a near-continuous offshore bank-barrier reef system, mid-channel patch reefs, and an inner reef system that begins 0.5 to three miles (0.8-4.8 km) off the coastline. The bank-barrier reef contains a number of distinct habitats or zones structured by water depth, degree of light penetration, and wave energy (FNAI 2010). These include a sheltered back reef/rubble zone, exposed reef crest, spur and groove zone, fore reef slope, and deep reef.

The most characteristic feature of the outer reef system are the high-profile slopes and ledges of living and fossilized corals, separated by deep sand channels. These form a series of coral fingers that extend perpendicular (seaward) to the reef system and are referred to as spur-and-groove formations. This habitat supports a diverse community of sea fans and branching gorgonians (octocorals), colonial sea anemones, sponges, and stony corals. Historically, it supported dense thickets of elkhorn coral on the shallow tops of the spurs, boulder corals on the sides of the spurs, and large stands of staghorn coral at the bases of the spur and in back reef habitats.

The reef crest is a very shallow zone that separates the spur and groove formations from the back reef. This zone is inhabited by species that can tolerate extreme conditions of low tides or breaking waves, such as mustard hill coral, encrusting brain corals, and fire coral.

Representative hard coral species include elkhorn coral (*Acropora palmata*), staghorn coral (*Acropora cervicornis*), mountainous star coral (*Orbicella faveolata*), brain corals (*Pseudodiploria strigosa*, *Diploria labyrinthiformis*, *Pseudodiploria clivosa*, and *Colpophyllia natans*), mustard hill coral (*Porites astreoides*), finger coral (*Porites porites*), starlet coral (*Siderastrea siderea*), and lettuce corals (*Agaricia agaricites*).

The deep reef gradually slopes away from the fore reef into deeper water and is generally composed of low-profile coral spurs and fossilized coral covered with fine sediment. While coral cover tends to decline in deeper water, boulder and brain corals become plate-like in response to reduced light levels, and many of the more fragile foliaceous and plating corals, finger corals, and other less common species (e.g., pillar coral, cactus coral) are found here.

Patch reefs

Over 6,000 patch reefs are found between the offshore reef system and the shoreline, occurring predominantly in the mid-channel within Hawk Channel and in inshore locations. Many of these patch reefs consist of small, scattered, circular, or elliptical shaped reefs, surrounded by sand halo, seagrass beds, or shallow hardbottom in nearshore environments.

Mid-channel patch reefs are in an area usually hidden by the turbid waters of Hawk Channel, the deeper body of water that separates the Florida Keys islands from the main outer reef tract. Mid-channel reefs rise up to 15 feet (4.6 m) from the bottom and provide an important refuge for fish and invertebrates during different stages of their life cycles.

The offshore patch reef habitat is a transitional zone between the mid-channel and inshore habitats and the outer reef tract. Offshore patch reefs are primarily located along the seaward edge of Hawk Channel, parallel to the outer reef tract. They consist of a diverse habitat with tall gorgonians (octocorals), abundant stony corals, and a diverse assemblage of sponges.

While these reefs generally do not support elkhorn coral, the dominant corals reefs include large frame-building boulder corals such as star coral (*Orbicella* spp. and *Montastraea cavernosa*), starlet coral (*Siderastrea siderea*), and brain corals (*Colpophyllia*, *Pseudodiploria*, and *Diploria* spp.). While living coral cover on outer reefs is typically about 5 percent today, many of the patch reefs still have very high coral cover (20-60 percent) along with a wide diversity of invertebrates, reef fish, and macroalgae. Associated flora and fauna vary greatly between shallow water and deep water patch reefs (FNAI 2010).

A common feature associated with patch reefs is the "halo" effect. A zone of barren solid substrate, sand, or rubble is formed as a result of grazing by various species of fishes and invertebrates. The organisms exit at night from the refuge of the coral heads to forage on the attached algae and seagrasses, thus leaving a "halo" of barren, exposed substrate surrounding the patch reef. An important function of halos on solidified substrates is that reef-expansion is made possible because coral recruitment can take place only on hard (consolidated) substrates (FNAI 2010).

Bleaching and disease

Reef-building corals are sensitive to sudden and prolonged changes in sea water temperatures, including elevated summer temperatures and colder than normal winter temperatures. These temperature fluctuations are a major contributing factor to coral bleaching and may increase susceptibility to disease. Large-scale coral bleaching was first recorded in the lower Florida Keys in 1979 along the outer reef tract, primarily in shallow fore-reef habitats (Jaap 1979). Bleaching has progressively become more widespread and severe, affecting reefs throughout Florida and the wider Caribbean in 1987 and 1990, and globally during the mass coral bleaching events in 1997 and 1998. The most severe cold water event since the 1970s impacted nearshore and mid-shelf reefs in the winter of 2010, and this was followed by the first multi-year bleaching event, which impacted reefs throughout FKNMS in 2014, 2015, and 2016 (Eakin et al. 2018). These bleaching events have contributed to a decline in living coral cover on reefs throughout the Florida Keys, although a number of resilient reefs and certain corals appear to be resistant to these temperature stresses.

Temperature data from NOAA's Coastal Marine Automated Network (C-MAN) station at Molasses Reef in FKNMS provide a more than 30-year continuous record of seawater temperatures on the outer reef. Data indicate that the summers of 2014 and 2015 and the winter of 2013-14 were the warmest on record (since 1988). The oldest known *in situ* temperature record of any coral reef is from Hens and Chickens Reef in the Florida Keys, which showed significant warming from 1975 to 2014 (Manzello, 2015). An analysis of this record by NOAA Atlantic Oceanographic and Meteorological Laboratory (AOML) scientists show a significant warming trend from 1975 to 2014, indicating that thermal stress to corals has increased appreciably over the past 40 years. This analysis predicts that coral bleaching events will become more frequent and severe over coming decades. The reef-building corals of Florida are now exceeding their upper thermal limits regularly, with seven mass bleaching events since 1987 that have impacted the entire reef tract.

Corals that are bleached and subsequently exposed to abnormal temperatures may be more vulnerable to disease. Coral diseases were first described in the Caribbean in the 1970s (Antonius 1973), and over the next two decades they spread among branching and boulder corals. Heat stress during bleaching events likely lowers the resistance of corals to pathogens, possibly due to a breakdown of their immune system. Outbreaks of disease have been reported after mass bleaching events and have severely damaged coral populations in some parts of the Caribbean. In the Florida Keys, diseases caused extensive declines to elkhorn coral and staghorn coral populations during the 1980s and 1990s, with further reductions from bleaching events over the last decade. Several new diseases also emerged in the 1990s and 2000s, including diseases affecting long-lived boulder corals, foliaceous corals, and sponges (Woodley et al. 2016).

Since the 2011 FKNMS condition report was released, additional resource issues have impacted the Florida Keys, including continued declines in stony coral cover due to cold and warm water bleaching

events (Lirman et al. 2011, Manzello 2015), diseases and predation (Williams and Miller 2012, Williams et al. 2017), and a recent hurricane (Hurricane Irma, September 2017).

A new coral disease (stony coral tissue loss disease or SCTLD) emerged near Miami in 2014 and slowly spread throughout the Florida Keys Reef Tract, reaching reefs off Key West in January 2019. SCTLD affects 22 species of stony coral, including five species listed as threatened under the ESA (Precht et al. 2016, Walton et al. 2018), and it has caused widespread declines to these corals. On many reefs, coral cover is now five to 10 percent or less. Even before the emergence of this latest disease, there had been a transition from stony coral dominance to benthic communities dominated by octocorals, colonial anemones, and other non-reef-building species (Ruzicka et al. 2013). This is the most severe and long lasting disease event ever reported to affect a coral reef, with 60 to 100 percent of corals dying over a few months to a year on affected reefs (DEP 2019). A large multi-agency response team is conducting research to determine the cause and contributing factors of this disease event and is developing intervention strategies to mitigate impacts and rescue corals.

Coral reef systems in the Florida Keys have developed very slowly over the last 10,000 years, increasing in height only about three millimeters per year during optimal periods when coral cover was high. Disease, temperature stress, physical impacts from boat groundings and anchors, and numerous other stressors have taken their toll on Florida's coral reef systems, affecting both the reef structure and thousands of species that use reefs as nursery, feeding, and refuge areas. Unless proactive steps are taken to reduce threats and restore damaged areas, coral communities critical to the survival of these ecosystems may take decades to fully recover, if they are ever able to (FNAI 2010).

Coral status

CREMP has conducted annual monitoring of the cover, diversity, and abundance of coral reef taxa in the sanctuary since 1996. These sites have shown a progressive decline in stony coral populations and concurrent increases in gorgonians (sea whips and sea fans), colonial anemones (*Palythoa*) and macroalgae. In 2016, mean benthic cover in the Florida Keys was 13.3 percent for octocorals, 19.6 percent for macroalgae, 6.5 percent for stony corals and 3.8 percent for sponges. The high values in macroalgal cover in recent years provide cause for concern as macroalgae directly compete for space with corals and octocorals on the reef. The reductions in coral cover in the Florida Keys have been attributed to multiple stressors, including coral bleaching, disease outbreaks, harmful algal blooms, hurricanes, anomalies in major weather patterns (e.g., cold water events), other water quality degradation, and physical impacts from vessels and/or anchor damage, all of which can cause coral mortality. Figure 4.2 shows CREMP data over time.

Federally-protected coral species

There are seven coral species within the Florida Keys that are listed as threatened under the ESA. NMFS listed two Acroporid coral species, elkhorn and staghorn, in 2006, and five additional species in 2014. Species descriptions for federally protected species can be found in Section 4.2.3.

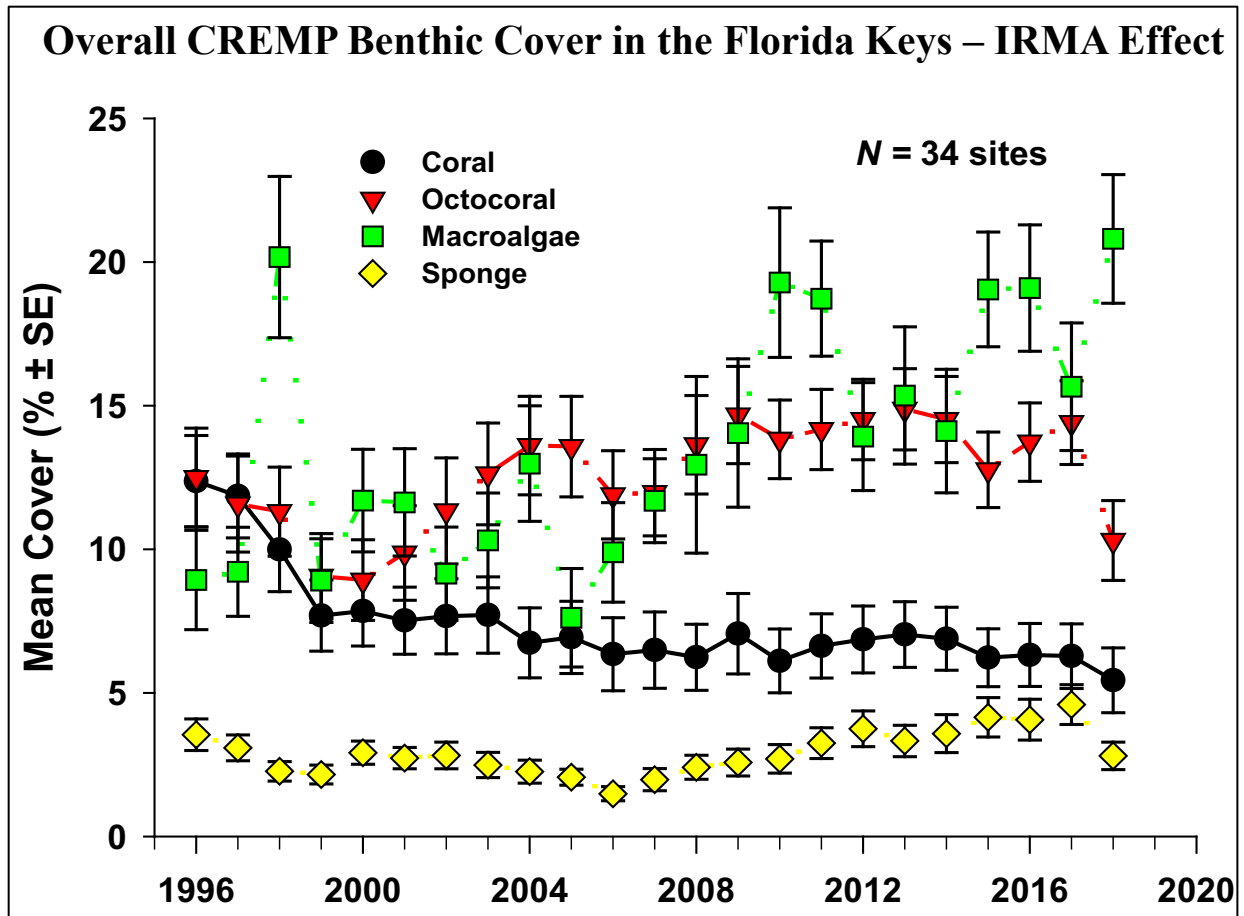


Figure 4.2. Trends in benthic cover for corals, octocorals, macroalgae, and sponges show changes over time (CREMP data 1996-2018). Source: FWC-FWRI

4.2.1.2 Consolidated substrate: Hardbottom

Shallow hardbottom communities are found throughout nearshore environments within the Florida Keys, on both the ocean and bay side, covering roughly 30 percent of the nearshore environment of the Florida Keys (Bertelsen et al. 2009). Hardbottom communities can form on exposed solid rock or on low-relief limestone substrates covered with a layer of sediment and sparse seagrass. Hardbottom communities support dozens of sponge species, along with sea fans and branching gorgonians, stony corals, and macroalgae. Many of the stony corals found here are unique and are typically rare in reef environments such as *Solenastrea* (smooth star coral) and *Manacina* (rose coral).

Typically, stony coral cover is low in hardbottom habitats, while sponges are the dominant invertebrates, occurring at densities of up to 80,000 sponges per hectare. The larger sponges, such as the loggerhead sponge (*Sphaciospongia vesparium*), are especially important, as these provide shelter and habitat for fish and invertebrates including juvenile Caribbean spiny lobster (*Panulirus argus*) and stone crab (Butler et al. 1995).

Hardbottom habitats form the foundation for the development of other marine and estuarine natural communities, and they are critical nursery areas for many commercially important invertebrates and fishes. However, this habitat can be easily degraded through siltation, sedimentation, or placement of fill (FNAI 2010). These habitats are also particularly sensitive to water quality changes associated with

thermal stress, salinity changes, and harmful algal blooms, some of which have originated in Florida Bay. For instance, catastrophic events in 1991, 2007, 2013, and 2016 associated with anomalous and persistent weather conditions resulted in widespread blooms of cyanobacteria and subsequent large-scale die-offs of sponges and other invertebrates (Stevely et al. 2011).

4.2.1.3 Unconsolidated substrate: Beaches, sandflats, and mudflats

Unconsolidated substrates are unconsolidified material. In the Florida Keys, common types include coralgall, marl, mud, mud/sand, sand, or shell. Unconsolidated sediments can originate from organic sources, such as decaying plant tissues (e.g., mud) or from calcium carbonate depositions of plants or animals (e.g., coralgall, marl, and shell substrates). While these areas may seem relatively barren, the densities of infaunal organisms in subtidal zones can be substantial, making these areas important feeding grounds for many bottom-feeding fish. Common infaunal organisms can include tube worms (Annelida), sand dollars and sea biscuits (Clypeasteroidea), mollusks, isopods, amphipods, burrowing shrimp (Thalassinidea), and an assortment of crabs. Submerged sandflats are also important settlement habitats for bonefish (Albulidae), snapper (Lutjanidae), grunts (Haemulidae), permit (*Trachinotus falcatus*), anchovies (Engraulidae), and other commercially important fishes (Snodgrass and Harden 2009). The intertidal and supratidal zones are extremely important feeding grounds for many shorebirds and invertebrates (FNAI 2010).

Tidal flats

Tidal flats are non-vegetated areas of sand or mud that are tidally submerged and protected from wave action. They provide habitat for a host of marine and terrestrial species throughout the year. Tidal flats provide essential foraging habitat for wading and shorebirds that hunt small fish, crustaceans, and marine invertebrates during low tide cycles. These birds include federally-listed species such as piping plover (*Charadrius melodus*), as well as numerous imperiled and state-threatened wading bird species.

4.2.1.4 Seagrasses

The Florida Keys ecosystem includes one of the world's largest seagrass beds. Seagrass occurs throughout the soft-bottom, shallow-water areas of the sanctuary wherever water quality allows adequate light penetration to enable photosynthesis. Seagrass present within the study area include turtle grass (*Thalassia testudinum*), the dominant seagrass community; shoal grass (*Halodule wrightii*); and manatee grass (*Syringodium filiforme*), with *Halophila* spp. found in some deeper seagrass habitats. Other living components of this habitat include thin finger coral (*Porites divaricata*) and various species of fish, macroalgae, sponges, and other invertebrates. Data from the sanctuary's WQPP seagrass monitoring indicates approximately 4,942 square miles (12,800 km²) of seagrass beds lie within and adjacent to the sanctuary.

Seagrass communities provide a range of ecosystem services, including stabilizing the bottom through their dense roots and rhizomes, and helping to maintain water clarity by trapping fine sediments and other particles in their leaves and root systems. Seagrass beds are integrally linked to reef environments, mangrove communities, and hardbottom habitats, both spatially and in terms of food webs (Valentine et al. 2008). Seagrass beds provide critical settlement and nursery habitat for juvenile life stages of many fishes and invertebrates, including crustaceans (e.g., lobster and shrimp) and molluscs (e.g., queen conch), as well as grunts, snapper, and other recreationally and commercially important marine life. Seagrass beds also provide foraging area for herbivores including turtles, West Indian manatees (*Trichechus manatus*),

parrotfishes (Scaridae), and sea urchins (Echinoidea), and refuge from predation for numerous invertebrates and fishes (Rudnick et al. 2005, Acosta et al. 2007). In addition, a number of unique and threatened marine invertebrates reside in seagrass beds, including stony corals that rarely occur on the reef (*Manicina* rose coral, *Porites* finger corals, branching *Oculina*, and *Solenastrea* star coral), sponges, soft corals, anemones, sea stars (Asteroidea), sea urchins, and sea cucumbers (Holothuroidea). An array of terrestrial wildlife, including great white heron (*Ardea herodias occidentalis*), reddish egret (*Egretta rufescens*), tricolored heron (*Egretta tricolor*), white pelicans (*Pelecanus erythrorhynchos*), and other seabird species are dependent upon seagrass communities for their diet (Waycott et al. 2009). Contiguous seagrass with minimal propeller scarring is critical in the protection of foraging areas for great white heron. Seagrass beds also provide long-term storage and sequestration of carbon, primarily in their soils.

Seagrass beds have declined in abundance and distribution and species composition has shifted in some nearshore areas due to water quality degradation and through the direct loss of habitat related to dredging, infilling, coastal development, and boating impacts (e.g., propeller scars and groundings).

Federally protected species in seagrass areas

Federally listed animal species that depend upon seagrass habitat in South Florida include: American crocodile (*Crocodylus acutus*), green sea turtle (*Chelonia mydas*), loggerhead sea turtle (*Caretta caretta*), hawksbill sea turtle (*Eretmochelys imbricata*), leatherback sea turtle (*Dermochelys coriacea*), Kemp's ridley sea turtle (*Lepidochelys kempii*), roseate tern (*Sterna dougallii dougallii*), wood stork (*Mycteria americana*), bald eagle (*Haliaeetus leucocephalus*), smalltooth sawfish (*Pristis pectinata*), West Indian manatee (*Trichechus manatus*), and others. See Section 4.2.3 for more information on listed species.

Seagrass habitat status

Seagrass habitat can be damaged by propeller scarring and prop wash blowout from powered vessels operating in shallow water, and from anchor damage. Disruptions can take many years to naturally recover without restoration assistance (Kenworthy 2002). Propeller damage impacts fish and invertebrate species diversity (Uhrin and Holmquist 2003), which negatively affects foraging habitat for imperiled wading bird species (Meyer and Kent 2011).

A mapping project conducted in 1995 and replicated in 2015 documented visible scarring and grounding impacts in shallow seagrass habitats from the sanctuary's northern boundary north of Ocean Reef to the west of Key West in the Marquesas Keys. Within these habitats, there was a 285 percent increase in severely impacted acres between 1995 to 2015, increasing from 5,060 acres (20 km²) to 19,462 acres (79 km²) (Kruer 2017).

Increased sea surface temperatures, reduced freshwater inputs and elevated salinity, and increased nutrients can contribute to episodic die-offs of seagrasses and shifts from seagrass dominance to macroalgae. A seagrass die-off occurred in Florida Bay in 1987 impacting 9,884 acres (40 km²) of seagrass (Hall et al. 2016). Florida Bay experienced another large-scale seagrass die-off in 2015 due to increased water temperatures, salinity, a stratified water column, and bottom water anoxia (lack of oxygen) (Hall et al. 2016).

The WQPP has conducted annual monitoring of seagrass extent and condition since 1995 at a total of 40 permanent monitoring sites (30 sites monitored since 1995 with 10 nearshore sites added in 2011). Trends show the species composition of the seagrass meadows within the sanctuary is changing towards faster-

growing plants and algae (manatee grass and macroalgae is replacing turtle grass), and seagrass meadows in nearshore areas are becoming less nutrient (nitrogen) limited, suggesting that less light is reaching the bottom and/or nutrient availability has increased (Fourqurean 2003). The natural system has historically been nutrient-limited, which has allowed seagrasses to outcompete algae for nutrient resources. Such changes in seagrass composition can impact the seagrass-based food web.

4.2.1.5 Macroalgae

Algae are photosynthetic organisms that lack many of the structures found in plants (e.g., leaves, roots, vascular system, and other distinct cell and tissue types) but can coexist with aquatic plants and often dominate many benthic habitats throughout the sanctuary (NOAA 2007). There are several different groups, often subdivided based on their color (e.g., red, brown, and green algae) and their growth form (e.g., crustose coralline algae, turf algae, and macroalgae). Due to their ability to grow in the marine environment and their size, fleshy macroalgae are commonly referred to as “seaweeds.” Like land-based “weeds,” seaweeds grow faster when they are fertilized and tend to grow rapidly when they are not grazed by sea urchins or fish.

To a major extent, macroalgae compete with corals, sponges, and other sessile invertebrates for living space on the seafloor, but it is important to note that macroalgae are a common and natural component of every coral reef system. Like seagrasses, they are a food source for a number of reef-dwelling animals, especially sea urchins and certain herbivorous reef fishes such as surgeonfishes (Acanthuridae) and parrotfishes. Typically, it is only when the ecological balance of a reef is upset (e.g., by widespread coral mortality from bleaching or disease, loss of herbivores, or input of high levels of nutrients) that it tends to become overgrown by the rapidly growing macroalgae (Maliao et al. 2008).

While too much macroalgae can be problematic for a reef, certain types of algae are a key component of a healthy environment. They provide important habitat for many small creatures and act as the base of the food web for many coral reef species. Some species, such as *Halimeda* spp., have branches that contain calcium carbonate, which become sand on the reef when the algae dies. Crustose coralline algae (CCA) is a type of red, calcified algae that forms a pink crust on the surface of the reef. CCA grows over rubble and broken coral, mollusk shells, and other skeletal materials, and essentially glues them together. It also provides an important substrate that promotes settlement of coral larvae (Szmant et al. 2006). Turf algae is a diverse assemblage of small, filamentous algae that forms a dense mat on hard substrates. Turf algae is an important food source for herbivorous parrotfishes and surgeonfishes, sea urchins, and crabs, and fills most of the space on the reef where corals are not already growing.

Many species of macroalgae are found in seagrass meadows, providing shelter and food for invertebrates and fishes. As long as these macroalgae do not outcompete and overgrow seagrasses, they are an important component of these habitats. Large blooms of *Laurencia*, *Dictyota*, and *Anadyomene* species have been documented in parts of Biscayne Bay to the immediate north of the sanctuary (Collado-Vides 2013). These blooms, associated with high loads of nutrients and fine sediments from urban and agricultural terrestrial sources, can smother seagrasses, reducing the benefits of those habitats and leading to hypoxic (low dissolved oxygen) to anoxic (no dissolved oxygen) conditions.

Pelagic sargassum (*Sargassum* spp.) provides shelter and food for small animals in the Atlantic Ocean offshore of the Florida Keys. Heavy sargassum transport throughout the Caribbean and to the shores of the Keys since 2010 has added some ecological benefits of organic material to beach and dune habitats,

but has also brought the negative effects of large quantities of decomposing organic material and anoxic conditions where it accumulates at seawalls and in canals.

In reef environments certain species of algae are seasonal, while others persist throughout the year. In addition to problems associated with the monopolization of substrates and overgrowth of slower growing corals under eutrophic conditions or in areas with reduced herbivory, several types of algae release toxic substances that can prevent successful settlement and survival of new corals. Some of the most problematic fleshy macroalgae include *Dictyota*, *Lobophora*, *Dasycladus*, and various filamentous cyanobacteria, as these overgrow corals and other invertebrates and can monopolize large areas of the reef. *Dictyota* often form seasonal blooms on reefs, and may cover up to 40 percent of the benthos in some areas of the Florida Keys (Kuffner et al. 2006). Because many of these chemically-defended algae are not preferred foods of herbivorous sea urchins, parrotfishes, or surgeonfishes, their dominance can have negative impacts on reef condition.

4.2.1.6 Mangroves

Mangrove communities range from tall, coastal forest to low, dense scrub communities, with each variety providing different physical habitats, topology, niches, microclimates, and food sources for a diverse assemblage of animals. Elevation ranges from shallow submerged land to about four inches above sea level. The roots of these trees are usually either constantly submerged or inundated daily by the tides. The red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), and white mangrove (*Laguncularia racemosa*) are considered to be the three true mangrove species found in the Florida Keys. Red mangrove trees fringe much of the 1,700 islands and shoreline within the sanctuary and are a vital component of the Florida Keys ecosystem, while the black and white mangrove species are found further up-slope in coastal wetlands.

Mangroves provide important shoreline protection services by buffering the action of waves and storm surges associated with both frontal and tropical storms. They also assist in trapping and cycling various organic materials, chemical elements, and important nutrients throughout the interconnected reef-seagrass-mangrove system. This includes serving as a sink for carbon both in living plant material and in the layers of soil and peat that make up the mangrove substrate. Detritus from mangrove leaves is also a carbon source for the food web, supporting decomposers and consumers. In addition, mangrove roots provide attachment surfaces for various marine organisms, many of which filter water and, in turn, trap and cycle nutrients. These prop roots also provide structure used by commercially- and recreationally-important reef fishes and crustaceans.

Mangrove communities are among the most biologically productive ecosystems in the world (Lugo and Snedaker 1974) and contribute to the overall health of the coastal zone. These forests are a vital component of the estuarine and marine environment, providing a major detrital base and essential nutrients to organic food chains; important habitat for arboreal, intertidal, and subtidal organisms; nursery areas for juvenile fish and crustaceans and other invertebrates; nesting sites; cover and foraging sites for migratory birds; and habitat for some reptiles and mammals, notably the federally endangered silver rice rat. Mangrove wetlands are excellent filters of runoff and provide a protective barrier that diminishes the intensity of storm surges on interior upland habitats. Mangroves provide protected nursery areas for young fish and crustaceans, shellfish, and other invertebrates (Drew and Eggleston 2008). Many of these species are food for a multitude of fish species, including important commercial or recreational species such as snapper, jack, snook, tarpon, sheepshead, and red drum. Mangrove tree canopies serve as roosting

areas and nesting areas, or rookeries, for coastal birds such as great white herons, reddish egrets, and brown pelicans (*Pelecanus occidentalis*), and oceanic birds such as magnificent frigatebirds.

Mangrove habitat status

Since the 1940s, when dredge and fill operations began in the Florida Keys, mangrove forests have suffered significant losses. Approximately 60 percent of shallow water mangroves in the Upper Keys were lost between 1965 and 1985 due to construction of marinas, airports, and seawalls; dredging of channels; and other commercial and residential construction. Mangrove forests in the Florida Keys have most recently been impacted by the high winds and storm surge from Hurricane Irma. At sites studied, impacts include a reduction in overall canopy cover; varied impacts to and recovery of the understory, including new seedling growth; and sedimentation of the understory, which in some cases led to smothering of roots and affected oxygen exchange (Radabaugh et al. 2019). While some recovery has occurred, mangrove forest recover can take 10 to 15 years.

Rhizophora mangle (red mangrove) lines approximately 1,800 miles of shoreline in the sanctuary.

4.2.1.7 Beach, berm, and dune habitats

Beach berms are dynamic and fragile ecosystems that host a wide diversity of species across three main vegetation classifications within a 10 foot (3 m) elevation range above sea level. These ecosystems are created and maintained naturally through the accretion and erosion of sediment from storm and wind events, setting back succession of vegetation through disturbance, and recolonization of vegetation through deposition of seeds that are transported through oceanic currents. Beach berms support a suite of terrestrial invertebrates, neotropical migrant and resident passerine and raptor species, reptiles, and small mammals; breeding and nectaring plants for imperiled butterfly species; refuge for eastern diamondback rattlesnakes (*Crotalus adamanteus*) and the Florida Keys mole skink (*Plestiodon egregius egregius*); and nesting habitat for green (*Chelonia mydas*), loggerhead (*Caretta caretta*), and hawksbill (*Eretmochelys imbricata*) sea turtles.

Of all berm hammocks in Key West National Wildlife Refuge, elevation is highest (6.5-10 feet / 2-3 m) and size greatest on the northwest side of the Marquesas Keys. Within this hammock is the only viable population of yellowheart trees (*Zanthoxylum flavum*) in the United States. Coastal prairies and beach berms occur landward of the dune at an elevation of three to seven feet (0.9 -2.1 m) and have moderate plant diversity on refuge islands in Key West National Wildlife Refuge. These habitats serve as the primary nectaring area for many terrestrial species including the Miami blue butterfly, whose only known population occurs within the Key West National Wildlife Refuge. Small patches of coastal prairie communities also occur among beach and dune systems in Key West National Wildlife Refuge.

Coastal berm and beach ridge hammocks are composed of narrow coastal berms that typically parallel a fringe of red mangrove (*Rhizophora mangle*), which is characterized by a ridge of storm-deposited debris that is subjected to an accumulation of flotsam. The substrate is coarse calcareous sand, which has accumulated to an elevation of one to two feet (0.3 - 0.6 m). A variety of plant associations develop on this ridge and include dense thickets of large shrubs, small trees, or sparse shrubby vegetation.

Beach ridge hardwood hammocks occur on high sand berms, within a few feet above sea level, created by storm surge and wind events. Although many of the plants found there are also found in tropical hardwood hammocks, this habitat is sufficiently different to warrant a separate classification (Folk et al.

1991). Trees in this habitat type grow on a sand or calcareous gravel substrate with low freshwater retention and are usually long, narrow linear features immediately adjacent to beaches. Beach ridge hammocks normally have relatively low plant diversity with a sparse understory, which may contain limber caper (*Capparis flexuosa*), Bahama nightshade (*Solanum bahamense*), and blackbead (*Pithecellobium guadalupense*). However, the latter may serve as the dominant species over a large area in some beach ridge hammocks. A nearly pure four-acre stand on Boca Grande Key provides an example.

Crocodile Lake National Wildlife Refuge maintains important tropical hardwood hammock habitat for the Key Largo woodrat (*Neotoma floridana smalli*), Key Largo cotton mouse (*Peromyscus gossypinus allapaticola*), and Schaus' swallowtail butterfly (*Heracles aristodemus ponceanus*). The refuge also maintains mangrove and beach berm habitats for nesting and wintering American crocodiles (*Crocodylus acutus*). Research has shown that invasive predators such as feral cats (Winchester et al. 2009) and Burmese pythons (*Python molurus bivittatus*) (Allgood and Savage 2011) are major threats to the woodrat and cotton mouse.

The coastal dune is found at an elevation of zero to four feet (1.2 m) and is adjacent to the intertidal zone. This area is primarily comprised of sandy soils and is sparsely vegetated with species such as bay cedar (*Suriana maritima*), sea oat (*Uniola paniculata*), and seashore dropseed (*Sporobolus virginicus*). Dunes are a fragile habitat easily damaged by humans, the extent of which depends on dune size and profile, quantity and type of flora, beach characteristics, and surrounding water depth (Liddle and Greig-Smith 1975, McDonnell 1981, Nickerson and Thibodeau, 1983). The beach-dune interface is an important ecological front that produces sustained levels of biological activity.

Beach and associated dunes are a prominent part of the Key West National Wildlife Refuge, occurring on Man, Woman, Marquesas (seven separate beaches), and Boca Grande keys, in Great White Heron National Wildlife Refuge on Mud, Marvin, Snipe, Sawyer, and West Content keys, and in National Key Deer Refuge on Lower Sugarloaf, Big Pine, and Ohio keys. Beach length varies from 15 to 8,530 feet (4.6-2600 m). All refuge beaches are narrow and coarse-grained, formed primarily of calcareous remains from various shallow water marine organisms. The beaches also afford important nesting, foraging, and loafing habitat for a variety of shorebirds, wading birds, and seabirds.

Protected species in beach, berm, and dune areas

The federally endangered Miami blue butterfly (*Cyclargus thomasi bethunebakeri*), roseate tern, and piping plover, as well as the state threatened least tern (*Sternula antillarum*) and reddish egret are found in these habitats. No marine plants within the study area are currently listed as federal threatened or endangered species. However, the threatened species of Johnson's seagrass (*Halophila johnsonii*) occurs in adjacent habitats in Biscayne Bay. Several terrestrial plants found within coastal rock barren and beach berm communities are listed as federal threatened or endangered species, including Cape Sable thoroughwort (endangered; *Eupatorium frustratum*), Garber's spurge (threatened; *Chamaesyce garberi*), and Blodgett's silverbush (threatened; *Argythamnia blodgettii*). About 25 populations of *E. frustratum* remain and are particularly susceptible to disturbance and habitat loss due to sea level rise. To see a list of listed species, including state species, see Appendix E.

4.2.2 Fish and wildlife resources

The Florida Keys archipelago serves as a biogeographic transition zone between the warm-temperate waters of the Gulf of Mexico and the adjacent tropical to subtropical waters of the Atlantic Ocean, resulting in a distribution of marine fauna and flora characterized by having both a warm-temperate and tropical Caribbean component (NOAA 1997). Therefore, this region hosts a wide range of fish and wildlife resources, including several special-status species. The following section contains general descriptions of ecologically-important living marine resources. Appendix E includes lists of federal and state status species.

4.2.2.1 Fish and marine invertebrates

The Florida Keys region is home to a diversity of fishes that are essential for ecosystem health, ecological function, recreation (e.g., snorkeling, scuba diving, sport fishing), and commercial fishing. Fish depend on healthy coral reef, seagrass, mangrove, and other habitats throughout their lives. Like their habitats, fishes are vulnerable to anthropogenic impacts via unsustainable levels of exploitation, climate change, habitat degradation, and variable water quality.

Historical long-term studies have identified between 389 and 440 total fish species in the Florida Keys (Longley and Hildebrand 1941, Starck 1968). Fishes inhabiting the Florida Keys have been described more recently in the sanctuary condition report (NOAA 2011) and other scientific studies (Burke et al. 2011, Hepner 2017, NOAA 2018c). The region supports a diversity of tropical and subtropical fish and shellfish species common to coral reef, shallow bank, seagrass, mangrove, and other habitats of the Caribbean and Gulf of Mexico. Many fishes use these habitats for spawning and nursery areas. Overall, the most abundant species are reef-associated fishes and can be classified into feeding guilds including invertivores, omnivores (generalists), herbivores, benthic carnivores, piscivores, and planktivores (Burke et al. 2011).

To evaluate the status and trends of reef fishes, a rigorous, collaborative, region-wide field survey, the Florida Keys Reef Visual Census (RVC), has monitored fish communities since 1998 (Smith et al. 2011). The 2016 Reef Visual Census observed a total of 233 fish species across all habitat strata along the entire extent of the Florida Keys region, and found the most abundant species to be masked goby (*Coryphopterus personatus*) and silversides (Atherinidae) (South Florida Reef Visual Census 2016). One scientific investigation using the Reef Visual Census dataset demonstrated that the diversity of fishes was higher in no take marine zones than in areas open to fishing (Hepner 2017). Among habitats, fish abundance, biomass, species richness, and diversity indices were highest in high relief reef habitats.

Snappers and groupers

Snappers (family Lutjanidae), groupers (family Serranidae), and other fishes make up an ecologically important complex of reef fishes that are harvested both commercially and recreationally throughout the Florida Keys. The sustainability of these species is of particular concern along the coast of South Florida because of their long-term overexploitation and slow recovery times following overharvesting. Fishes in the reef fish and snapper-grouper complexes of the Gulf of Mexico and South Atlantic, respectively, are generally long-lived, slow-growing, and late-maturing, making them particularly vulnerable to exploitation. These fishes use many inshore and offshore habitats during their life cycle (Ault et al. 2005), and some species form spawning aggregations on the offshore bank-barrier reef system (discussed below; Schmidt et al. 1999). Currents disperse their eggs/larvae, with most moving and settling into nearshore

habitats and nursery areas where they grow to juveniles and subsequently move back out to the reef as adults (e.g., Ault et al. 2012, Bryan et al. 2015).

The SAFMC and GMFMC have developed a variety of harvest regulations and protected areas that have been implemented by NMFS to prevent overfishing and rebuild overfished reef fish and snapper-grouper stocks. These species are subject to fisheries regulations by the SAFMC under the Snapper-Grouper Fishery Management Plan (FMP) for the Snapper-Grouper Fishery of the South Atlantic Region (FMP, 59 species) and by the GMFMC under the FMP for the Reef Fish Resources of the Gulf of Mexico (30 species). As of the first quarter of 2019, the report to Congress indicated that in the South Atlantic, Southeast Florida hogfish (*Lachnolaimus maximus*), red snapper (*Lutjanus campechanus*), red porgy (*Pagrus pagrus*), and snowy grouper (*Hyporthodus niveatus*) were overfished and Southeast Florida hogfish, red snapper, blueline tilefish (*Caulolatilus microps*), speckled hind (*Epinephelus drummondhayi*), and Warsaw grouper (*Hyporthodus nigritus*) were experiencing overfishing. In the Gulf of Mexico, greater amberjack (*Seriola dumerili*) was overfished (NMFS 2019). NMFS defines “overfished” as a population that has declined below sustainable harvest limits and “experiencing overfishing” as a population that is currently undergoing unsustainable harvest.

Several investigations have demonstrated the utility of fisheries harvest restrictions and protected areas for restoring reef fish and snapper-grouper populations. Using the RVC dataset for the Dry Tortugas region, one analysis showed a substantial increase in mutton snapper (*Lutjanus analis*) abundance and size along many reef habitats between 1999-2000 and 2012-2014 (Figure 4.3; FWC-FWRI 2015). Additionally, densities of black grouper (*Mycteroperca bonaci*) and yellowtail snapper (*Ocyurus chrysurus*) were significantly higher in protected areas of the Dry Tortugas than in adjacent unprotected zones during most years of RVC sampling (FWRI 2019). Protected areas within the Dry Tortugas also observed up to a 20 percent increase in abundance of harvestable size black grouper. Overall, recent research has demonstrated increases in size and abundance of harvested fishes within reserve areas in the Florida Keys (e.g., Ault et al. 2012, Ault et al. 2014).

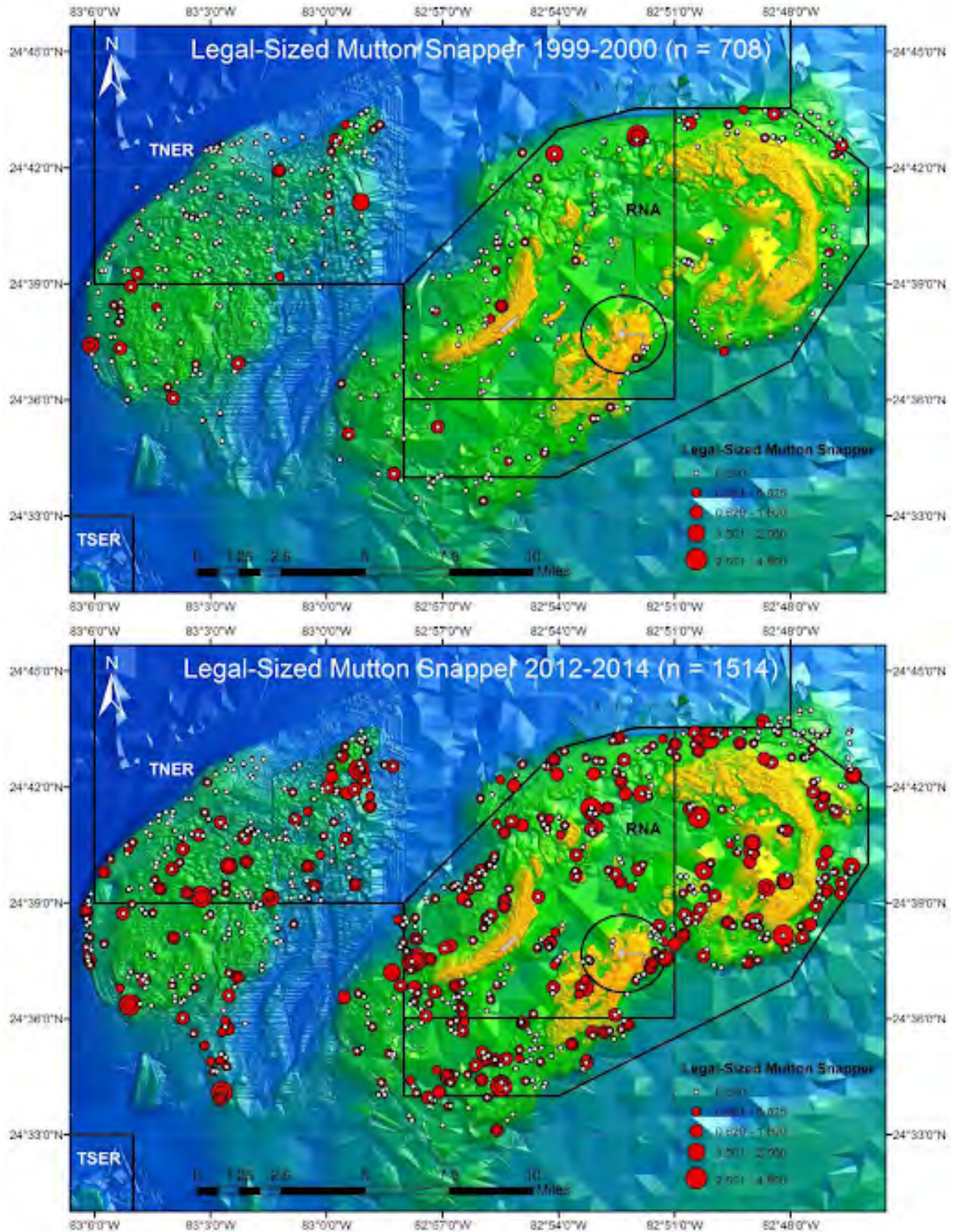


Figure 4.3. Mutton snapper size and density in the Tortugas region during 1999-2000 (top panel) and 2012-2014 (bottom panel). Image: FWC-FWRI presentation, 2015

Hogfish (*Lachnolaimus maximus*)

Similar to other fishes in the snapper-grouper complex, hogfish rely on reef habitats for protection from predators and daytime feeding on benthic invertebrates. Hogfish occupy tropical and subtropical waters of the Atlantic Ocean, Gulf of Mexico, and Caribbean, and in 2017, the SAFMC finalized a measure defining a distinct hogfish stock for the Florida Keys/East Florida.

Hogfish life history is characterized by a pelagic larval phase lasting 30-40 days, nearshore settlement in shallow seagrass, reef, or estuarine habitats, followed by movement offshore and eventual adult association with reef habitats, where they have been observed at depths up to 213 feet (65 meters). They are sequential, protogynous hermaphrodites, meaning that juveniles start out as female and mature to become males at about three years of age and 14 inches (35 cm) in size. Hogfish form social groups called harems, where one male will protect and spawn with a group of females within his territory. Their spawning season typically occurs during December through April in the Florida Keys. Like other exploited reef fishes, hogfish are vulnerable to overharvesting due to their life history strategy and history of being overfished.

Fish spawning aggregations

Many reef fishes form spawning aggregations, which occur when fish assemble in higher than usual densities to reproduce. Fish spawning aggregations typically occur at the same place and time each year within a species, but spawning behavior tends to be highly variable across species (SCRFA 2013). Fish spawning aggregations benefit fish populations by increasing reproductive success, increasing population-scale genetic diversity, and providing protection from predators (Young et al. 2014, Farmer et al. 2017). However, fishes that use spawning aggregations are particularly vulnerable to overexploitation because of the predictability in which they occupy these habitats; therefore, protecting fish spawning aggregations is especially important for promoting sustainable fisheries resources (e.g., Nemeth 2012, Ault et al. 2013). When a fish spawning aggregations becomes depleted, it can take decades to recover, showing the importance of protecting these existing resources and the environments where spawning aggregation behavior is known to occur.

In the Florida Keys, 14 reef-associated fishes are known to exhibit spawning aggregation behavior, including several species in the heavily exploited snapper-grouper complex (e.g., Rowell et al. 2015). In the upper Florida Keys region, there has been visual evidence of fish spawning aggregations by cubera snapper (*Lutjanus cyanopterus*), black grouper, and mutton snapper within the sanctuary boundary but outside of the SPAs. Similarly, in the lower Florida Keys, mutton snapper, gray snapper (*Lutjanus griseus*), yellowtail snapper, and other species have been observed by divers and fishing boats exhibiting spawning behavior at Western Dry Rocks, Mangrove Toppino, Eyeglass Bar, and Maryland Shoal (Figure 4.4; FWRI presentation 2013).

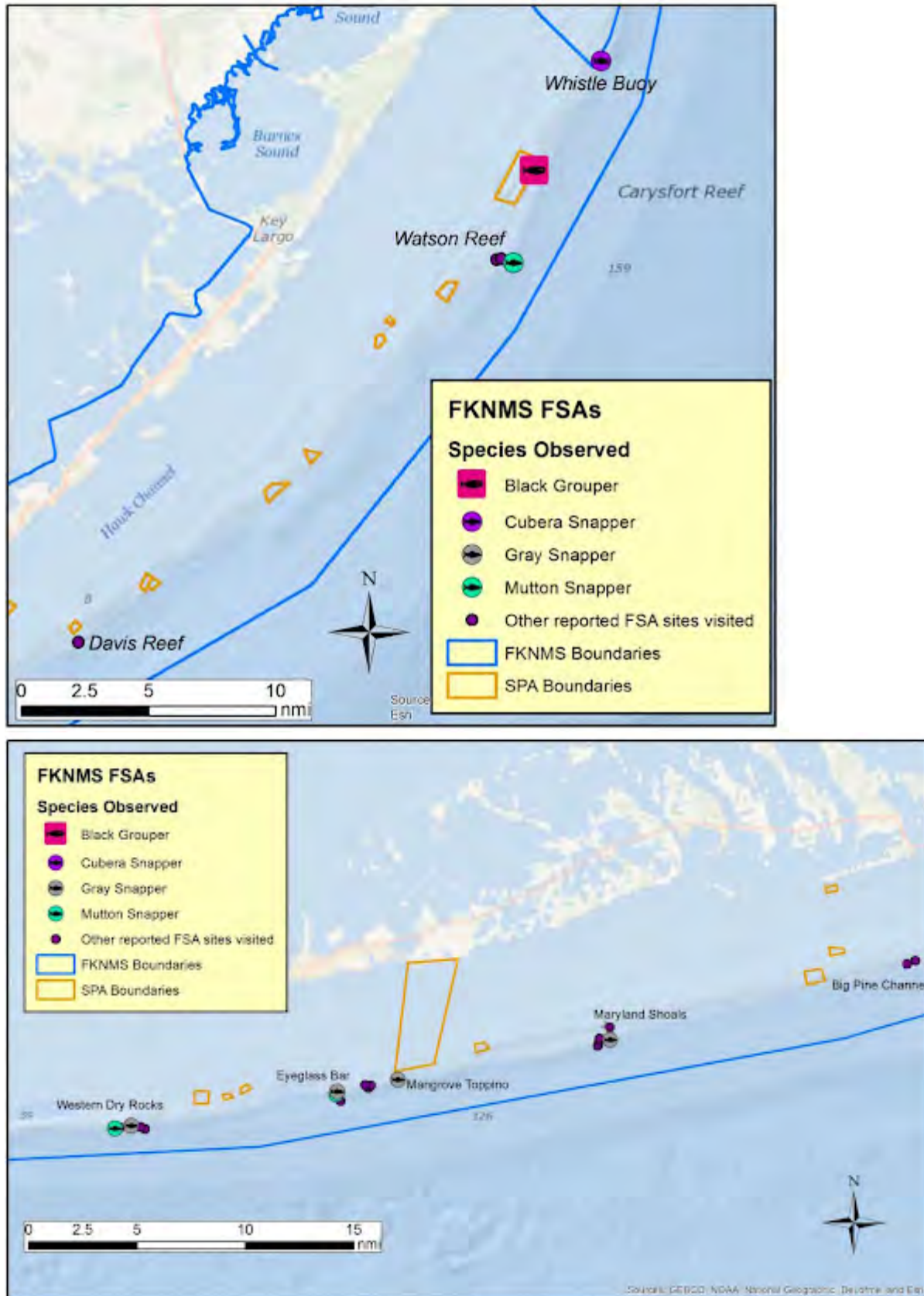


Figure 4.4. Fish spawning aggregation sites in the Florida Keys. Image: NOAA and FWC-FWRI

The Dry Tortugas region also provides important fish spawning aggregation habitat for mutton snapper, cubera snapper, and other fishes (Feeley et al. 2012, Bryan et al. 2015, FWRI presentation 2019). In particular, multispecies spawning aggregations have been observed at Riley's Hump (Tortugas South ER), and there is evidence of a spawning corridor for mutton snapper between Riley's Hump and the Tortugas Research Natural Area (Figure 4.5; FWC-FRWI presentation 2013). The geomorphology common in the Dry Tortugas and other areas throughout the Florida Keys is typical of other Caribbean fish spawning aggregation sites (Heyman and Kjerfve 2008), suggesting that new proposed zones may include more areas where spawning aggregations occur or where historical evidence of them exists.

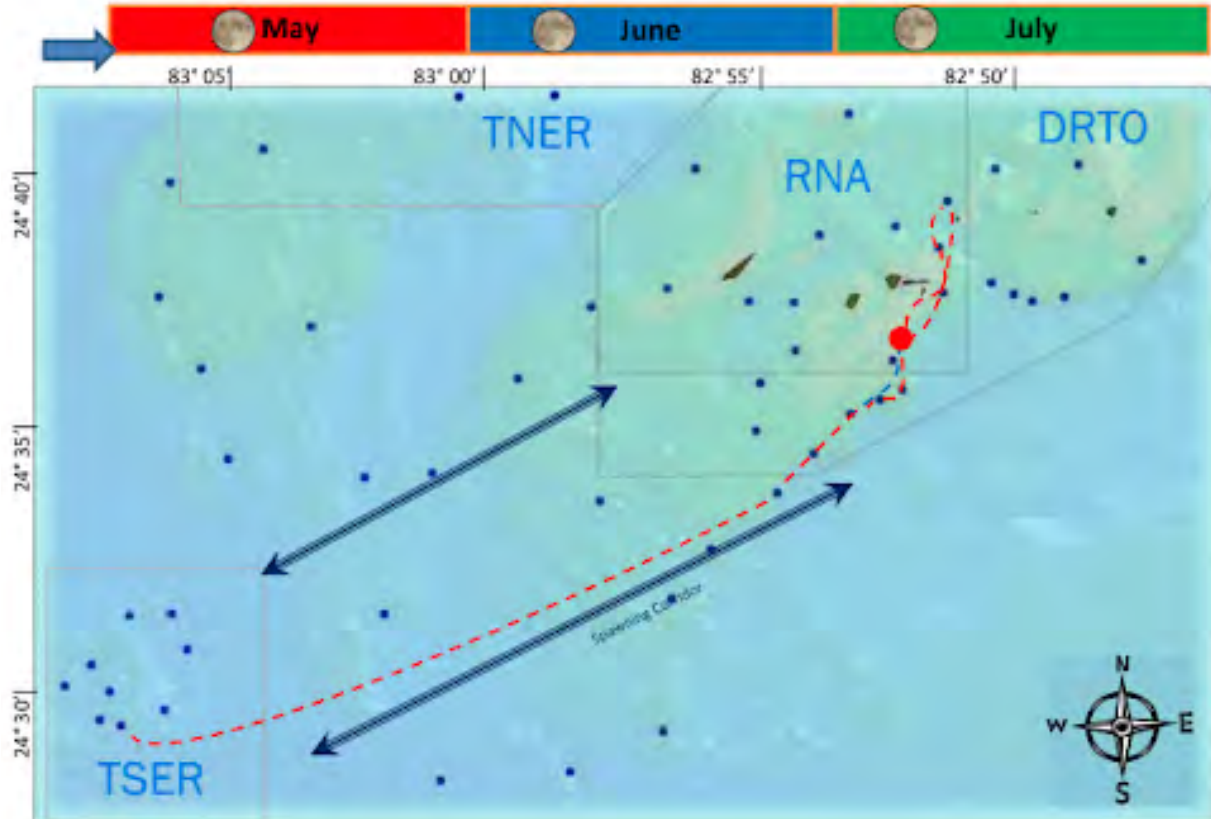


Figure 4.5. Fish transiting (shown by dotted red line) between Dry Tortugas National Park and Tortugas Ecological Reserve during spring/summer full moons. Image: FWC-FRWI

Pelagic fishes and sharks

Many species migrate and thus spend a portion of their time in the sanctuary. These species include, but are not limited to, the following pelagic species: Atlantic bigeye tuna (*Thunnus obesus*), North Atlantic albacore tuna (*Thunnus alalunga*), Atlantic yellowfin tuna (*Thunnus albacares*), Atlantic skipjack tuna (*Katsuwonus pelamis*), Western Atlantic bluefin tuna (*Thunnus thynnus*), Atlantic common thresher shark (*Alopias vulpinus*), Atlantic sharpnose shark (*Rhizoprionodon terraenovae*), Atlantic shortfin mako shark (*Isurus oxyrinchus*), oceanic whitetip shark (*Carcharhinus longimanus*), Atlantic blacktip shark (*Carcharhinus limbatus*), North Atlantic swordfish (*Xiphias gladius*), Atlantic mahimahi (*Coryphaena hippurus*), Atlantic wahoo (*Acanthocybium solandri*), cobia (*Rachycentron canadum*), and king mackerel (*Scomberomorus cavalla*). Tuna, mahimahi, wahoo, swordfish, and shark catches are included in the landing data in Table 4.2.

Marine invertebrates

Invertebrates in the sanctuary are highly diverse and comprise a large portion of the marine fauna inhabiting all habitat types in the sanctuary. Resident phyla include, but are not limited to, Cnidaria (corals, sea anemones, jellyfish), Platyhelminthes (flatworms), Porifera (sponges), Annelida (segmented worms), Arthropoda (crustaceans), Ectoprocta (bryozoans), Mollusca (bivalves and snails), and Echinodermata (sea stars, sea urchins, and sea cucumbers). With the exception of a few “fishery” crustaceans (e.g., shrimp, lobster, stone crab), the ecological roles of many of these invertebrates are not well understood and continue to be studied (Levy et al. 1996). See sections 4.2.1 and 4.2.3 for more details on coral species.

Spiny lobster

The Caribbean spiny lobster (*Panulirus argus*) is widely distributed throughout the western Atlantic Ocean, ranging from North Carolina to Brazil, inclusive of the Caribbean and Central America. However, in the Gulf of Mexico and South Atlantic regions, the commercial fishery and most of the recreational fishery occurs off South Florida (GMFMC 2017).

Caribbean spiny lobsters are found throughout the mangrove, shallow hardbottom, seagrass, and reef habitats of the Florida Keys. Postlarvae settle in nearshore, architecturally-complex substrates, especially hardbottom habitat covered by red macroalgae. Once juveniles reach 0.59-0.79 in (15-20 mm) carapace length, they emerge from the algae and take up refuge in crevices under sponges, octocorals, and corals, and also within dissolved limestone burrows and in seagrass blowouts. Larger juveniles migrate to patch reef and offshore reef systems, and both male and female lobsters travel from their shelters to foraging grounds on a daily basis. During the reproductive season, female lobsters undergo migrations to deeper waters and outlier reefs to release eggs (Cox and Hunt 2005). Lobsters are an important component in the seagrass ecosystem, as they are food for many fish species.

Caribbean spiny lobster is one of the Florida Keys’ most economically important commercial fisheries, and while they are heavily exploited by both the commercial fishery and by recreational divers and snorkelers, their population currently appears to be stable (GMFMC 2017). The lobster population in the Florida Keys benefits from larvae that originate elsewhere in the Caribbean and are transported to the hardbottom habitats of the Florida Keys by ocean currents. In the sanctuary, lobster fishery restrictions at the Western Sambo Ecological Reserve have led to an increase in mean size and frequency of occurrence of this species (Cox and Hunt 2005) as well as retention of older individuals and more mature females, which has contributed to increased stability in the population (Matthews 2016).

The spiny lobster fishery poses an environmental concern because it is estimated that thousands of traps are lost annually in the Florida Keys, leading to ghost fishing (Butler and Matthews 2015). Ghost fishing lobster traps (those lost due to storms and boat propellers) have been shown to lead to mortality of approximately 643,000 lobster per year. Additionally, lobster trap debris including concrete, buoys, and rope can be washed up on shorelines and remain in the marine environment for decades. According to FWC surveys, approximately 70 percent of marine debris in the Florida Keys is composed of lobster traps and associated gear, which can damage benthic fragile coral and seagrass habitats (Uhrin et al. 2014).

Stone crab

The stone crab (*Menippe mercenaria*) supports a lucrative fishery in Florida, which has been overexploited since 1997 and is currently estimated to be overfished (Gandy et al. 2010). This species ranges from North Carolina to the Caribbean including the eastern Gulf of Mexico, and is locally managed by the state of Florida. Uniquely, the stone crab fishery involves harvesting one of the claws and returning live individuals back into the water. Stone crabs are predatory, feeding primarily on small mollusks, polychaete worms, and other crustaceans in hardbottom reefs and seagrass habitats. Females reach maturity at approximately two years old, and they are known to spawn from June to October off continental areas and at lower frequencies from November to May in southern Florida (Gerhart and Bert 2008). Stone crabs are pelagic during their larval and post-larval stages, approximately three to six weeks, before they settle on a benthic substrate as juveniles. Inhabiting nearshore environments during most of their lives, stone crabs are vulnerable to changes in water chemistry including acidification (Gravinese et al. 2018).

Shrimp species

The commercial shrimp fishery, composed of brown shrimp (*Farfantepenaeus aztecus*), white shrimp (*Litopenaeus setiferus*), pink shrimp (*Farfantepenaeus duorarum*), royal red shrimp (*Hymenopenaeus robustus*), and rock shrimp (*Sicyonia brevirostris*) (all of which are federally managed), is one of the most important fisheries in the Florida Keys. SAFMC and GMFMC measures to protect these stocks and their habitat have included closed areas in federal waters to protect spawning white shrimp, the requirement for bycatch reduction devices to minimize bycatch, and the prohibition on rock shrimp trawling in *Oculina* coral areas.

Brown shrimp, white shrimp, and pink shrimp are found in shallower state and federal waters while royal red and rock shrimp occur in deeper waters. Pink shrimp are historically common in estuaries and shallow marine waters surrounding southern Florida and in the deep waters (approximately 328 ft/100 m) southeast of the Florida Keys, and are the dominant species within the Dry Tortugas shrimping grounds and Florida Bay (Saloman 1968). Adult pink shrimp congregate in deep water (>36 ft/11 m) off the Dry Tortugas to spawn. Larvae can take two routes to estuarine nursery areas where they spend most of their life cycle. One route is directly to the shallow-water estuaries of the Ten Thousand Islands, Whitewater Bay, and Florida Bay. Alternately, larvae are swept southwesterly into the Florida Current by way of the Loop Current, and are carried northeasterly along the outer edge of the Florida Keys Reef Tract or east coast of Florida (Ingle et al. 1959). As the postlarval pink shrimp mature, they enter Florida Bay on incoming tides. Young shrimp spend from two to seven months in the bay's seagrass nursery grounds before moving into the Gulf off the Dry Tortugas (Schomer and Drew 1982, Bielsa et al. 1983).

Shrimp with important ecological associations include cleaner shrimp and peppermint shrimp (genera *Periclimenes* or *Lysmata*), coral shrimp (genus *Stenopus*), and snapping shrimp (genus *Alpheus*). Snapping shrimp, in particular, exhibit a commensal association with certain sponges, and the snapping sound coming from the vicinity of the sponges attracts larval lobster (e.g., Butler et al. 2017). Additionally, snapping shrimp densities have been shown to be greater in protected habitats than in degraded habitats in Florida Bay.

Other hardbottom invertebrates

Sponges (Porifera) are important components of coral reef ecosystems, occurring on reefs, shallow hardbottom communities, seagrass beds, and mangrove prop roots. Some species form massive balls, tubes, and barrels, achieving sizes of up to three feet in height. Besides filtering large amounts of water, sponges in nearshore hardbottom habitat are critical shelter habitat for a myriad of obligate and opportunistic invertebrates and fish such as crabs, shrimps, and brittle stars (Ophiuroidea, McMurray et al. 2008). Some sponges, such as *Cliona* spp., are known as boring or excavating sponges that bore into and dissolve the reef framework, reef building corals, mollusks, and other organisms with a limestone skeleton, forming a key process in a reef's carbonate budget. This genus has been on the increase in recent years, likely due to climate change and eutrophication, which could result in continued damage to coral reefs in the Florida Keys (Keller and Donahue 2006, Chiappone et al. 2007).

Sea urchins, more specifically the long-spined sea urchin (*Diadema antillarum*), were historically one of the most important invertebrate grazers on coral reefs in the Florida Keys, helping control the abundance of algae. The massive die-off of *Diadema* that began in the Caribbean in 1983 caused cascading effects in coral reefs throughout the region. Prior to the die-off, these urchins created halos or barrens around the reef and they controlled algal growth, serving a critical functional role in keeping hard surfaces clean to allow settlement and growth of coral larvae (Levitan 1988). Other urchins, crabs, and herbivorous fishes such as parrotfish and surgeonfish have partially filled the important role in controlling algal dominance on coral reefs (Furman and Heck 2008), but the proliferation of fleshy macroalgae since the die-off of urchins has contributed to the decline of coral cover within reef environments.

Marine life: Ornamental species

The state of Florida maintains the largest aquarium or ornamental fishery in the United States, which is distributed among a limited number of licenses (see Section 4.6 for more information). While marine life harvesters are required to use sustainable practices, capture and trade of these species can be difficult to monitor and enforce. Ecological function of harvested marine life fish fishery species includes bioturbators, filterers, scavengers, and predators, and this fishery is dominated by collection of grazers (Rhyne et al. 2009).

In a May 2019 report, Florida FWC evaluated time series data for 27 marine life taxa (e.g., *Ricordea* [false corals], ringed anemone, balloonfish) that showed a pattern of negative landings and catch per unit effort values combined with an ex-vessel price (i.e., the dockside value or average price for a given species) trend that was either stable or increasing, a combination that can indicate a potential sustainability issue. FWC stressed that interpreting the results of these trends as an indicator of an individual taxon's status should include other considerations. Marine life listed taxa consist of a diverse array of organisms whose ecology and life history vary greatly, and many are infrequently reported within the trip ticket database (Sharp and Sheridan 2019).

Live rock aquaculture

Live rock is a valuable commodity, used primarily in home aquaria, which consists of limestone reef framework (coral skeletons) and associated coralline algae, fleshy algae, and invertebrates. Removing live rock by chipping or breaking it from the reef framework harms or destroys habitat for other key marine species, increases erosion, and reduces biodiversity (Bruckner 2000). Recognizing the destructiveness of this practice, the state of Florida prohibited live rock harvest in waters of the state in 1992. The SAFMC

and GMFMC followed suit by prohibiting live rock harvest in federal waters of the Atlantic Ocean and Gulf of Mexico in 1995 and 1996, respectively. The state and fishery management councils then developed lease and permit processes by which limestone rocks that were mined from quarries on land could be placed into state and federal waters off the coast of Florida to allow colonization by bacteria and other organisms. After several years, these rocks are harvested for use in aquaria as substrate upon which to build a reef display or to maintain aquaria water quality.

In state of Florida waters, a submerged lands lease, managed by the Florida Department of Agriculture and Consumer Services (FDACS), is required to conduct live rock aquaculture. In federal waters off the coast of Florida, a permit from NMFS is required for live rock aquaculture. With the exception of coral species listed under the ESA, all organisms that settle and grow on aquacultured live rock may be harvested and sold by the lease or permit holder.

Some threats associated with live rock aquaculture include reduction of hardbottom and sand habitat available for other species, potential spread of non-native species, and increased risk of spreading coral disease. The illegal harvest of wild live rock from Florida and elsewhere in the Caribbean and around the world, and use of permitted live rock aquaculture sites as a front for illegal wild live rock harvest, remains a serious threat to reef habitats and species. Multiple state and federal enforcement actions have been taken to address illegal live rock activities; such actions may be complicated when live rock aquaculture is permitted to occur.

4.2.2.2 Wildlife

Marine mammals: Cetaceans and sirenians

The Florida Keys and the sanctuary are within the seasonal geographic range of a variety of marine mammals. Thirteen species of whales, seven species of dolphins, and the West Indian manatee either reside in or travel through the sanctuary at some point in their lifetimes. (See Section 4.2.3 for more information on whales and manatees.)

While not endangered, bottlenose dolphin (*Tursiops truncatus*) are present in the sanctuary and are protected by the Marine Mammal Protection Act (MMPA, 16 U.S.C. §§ 1361 *et seq.*). Bottlenose dolphins occur in the area year-round. They tend to inhabit coastal and offshore areas and may feed in shallow areas throughout the Florida Keys with higher prevalence in the Lower Keys region.

Birds

The Florida Keys host more than 285 species of birds, many of which are seabird or shorebird species. Birds most frequently encountered in and around the waters of the sanctuary include terns, gulls, plovers, sandpipers, cormorants, pelicans, herons, egrets, osprey (*Pandion haliaetus*), and the magnificent frigatebird (*Fregata magnificens*). The Florida Keys National Wildlife Refuges are managed, in part, for the diversity of migratory and resident bird species that use these habitats. For example, Great White Heron National Wildlife Refuge was established with the purpose of providing mangrove nesting and seagrass foraging habitat for the great white heron (*Ardea herodias occidentalis*) and other imperiled wading bird species. The federally threatened roseate tern nests in Key West National Wildlife Refuge on exposed sandbars. Federally threatened piping plover and red knot (*Calidris canutus*) use the sandy beaches and tidal flats of the Key West, Great White Heron, and National Key Deer refuges as both

stopover and wintering areas. Wood stork (*Mycteria americana*) also use the Lower Keys refuges for foraging and roosting.

The red knot is an ESA-listed threatened species. State-listed species include the aforementioned species, as well as the least tern (*Sternula antillarum*), peregrine falcon (*Falco peregrinus*), snowy plover (*Charadrius nivosus*), roseate spoonbill (*Platalea ajaja*), reddish egret (*Egretta rufescens*), tricolored heron (*Egretta tricolor*), little blue heron (*Egretta caerulea*), and white-crowned pigeon (*Patagioenas leucocephala*).

The Florida Keys National Wildlife Refuges are also an important stopover point for other migratory raptors, neotropical and resident land birds and are listed as an Audubon Important Bird Area. Shorebirds and wading birds forage along tidal flats, seagrass beds, and sandy beaches that are often used by recreational boaters, kayakers, fishermen, snorkelers, and wildlife viewers. It is critical to the health of these species that select foraging, nesting, loafing, and staging areas are protected from human disturbance. (See Section 4.2.3 for more information on listed species and Appendix E for a full species list.)

In an attempt to protect these species and prevent them from becoming listed as threatened and/or endangered species, these species are given high priority in national wildlife refuge management decisions.

Shorebirds, waterbirds, and marshbirds

Waterbirds serve as important indicators of ecological health in coastal marine habitats (Ogden et al. 2014). The Florida Keys refuges contain extensive mangrove and shallow-water habitats that are important foraging and loafing sites for several species of imperiled wading birds and migratory shorebirds. The refuges harbor all species of Florida wading birds as either nesters or migrants. Known nesters include all Florida great white heron, great blue heron (*Ardea herodias*), great egret, reddish egret, tricolored heron, little blue heron, green heron (*Butorides virescens*), and yellow-crowned night-heron (*Nyctanassa violacea*), as well as the white ibis (*Eudocimus albus*). The refuges are particularly important to nesting great white herons.

Other birds that have nested in the refuges include black neck stilt, Wilson's plover (*Charadrius wilsonia*), brown pelican, white ibis, magnificent frigatebird, least tern, roseate tern, and double-crested cormorant (*Phalacrocorax auritus*). Brown pelican nesting has declined markedly in Key West National Wildlife Refuge since 1987. The historical (1986-2005) nesting colony in the Marquesas Keys was abandoned in 2005, with no sign of nesting activity in 2006 through 2008. One rookery remains in Key West National Wildlife Refuge. Non-nesting, fish-eating birds include various tern and gull species. Descriptions of piping plover, roseate tern, and red knot can be found in Section 4.2.3.

Raptors (hawks and allies)

The Florida Keys refuges are situated along a major migratory pathway for raptors. Sixteen migratory species have been observed in the refuges. Migration begins in late August with the passage of swallow-tailed kites (*Elanoides forficatus*) and ends in November with the passage of Swainson's hawks (*Buteo swainsoni*). Broad-winged hawks (*Buteo platypterus*), peregrine falcons, ospreys, sharp-shinned hawks (*Accipiter striatus*), and American kestrels (*Falco sparverius*) are the most abundant migratory raptors. More peregrine falcons pass over the Florida Keys than any other hawk observation sites in North

America (Lott 2006). While most of the migratory raptors use the refuges as a resting and foraging stopover en route to South America, significant numbers of certain species overwinter, such as the broad-winged hawk and short-tailed hawk (*Buteo brachyurus*). Bald eagle nesting was monitored annually from 1985 to 2009 with four to six active nests sighted annually. Some islands were used for nesting for over 20 years and others for only a few years, with pairs moving elsewhere. Osprey and red-shouldered hawks (*Buteo lineatus*) also nest in the refuges.

Waterfowl

Waterfowl do not nest in the Florida Keys refuges. Apart from small numbers of overwintering red-breasted mergansers (*Mergus serrator*) and blue-winged teal (*Anas discors*) seen annually, other migratory waterfowl are rarely observed.

Resident landbirds

Red-bellied woodpeckers (*Melanerpes carolinus*), red-winged blackbirds (*Agelaius phoeniceus*), gray kingbird (*Tyrannus dominicensis*), black-whiskered vireo (*Vireo altiloquus*), white-eyed vireo (*Vireo griseus*), white-crowned pigeon, and mangrove clapper rail (*Rallus longirostris*) are among the more common resident breeding birds. The only warbler species known to breed in the Florida Keys Refuges are Cuban yellow (*Dendroica petechia gundlachi*) and prairie (*Dendroica discolor*) warblers. Both are common breeders in the backcountry islands. The mangrove cuckoo (*Coccyzus minor*) is listed as a species of concern on the 2014 State of the Birds Watch List, but data are lacking on its status and ecology in the Florida Keys.

Neotropical migratory birds

Neotropical migratory birds are species that breed in North America and winter in Mexico, Central America, the Caribbean, and South America. These species are of keen interest to birdwatchers and conservationists because they migrate remarkable distances in all weather conditions, and they provide a diversity of viewing opportunities during the spring and fall migration, more than doubling the number of species seen in the Florida Keys compared to the nesting season. Many are experiencing range-wide declines due to the destruction and fragmentation of breeding and wintering habitat, poisoning by pesticides, collisions with towers and large buildings, and feral cat predation.

Reptiles

The Florida Keys and the sanctuary are within the seasonal geographic range of a variety of reptiles, including five of the seven living sea turtle species, as well as the American crocodile (*Crocodylus acutus*) and American alligator (*Alligator mississippiensis*).

Turtles

Five of the seven sea turtle species frequent the waters of the sanctuary, and some species, including the green (*Chelonia mydas*), loggerhead (*Caretta caretta*), hawksbill (*Eretmochelys imbricata*), and leatherback (*Dermochelys coriacea*) sea turtles, nest within the Florida Keys. All marine turtles are either threatened or endangered and thus protected by the ESA in U.S. territorial waters (see Section 4.2.3 for more details). The highest densities of sea turtles in the Gulf of Mexico region are observed in waters surrounding the Florida Keys (McDaniel et al. 2000).

Nesting by sea turtles on beach berms occurs throughout the Florida Keys National Wildlife Refuges. The beaches of Boca Grande, Woman Key, and the Marquesas are most heavily used by green and loggerhead sea turtles during the summer and autumn, although several islands within Great White Heron National Wildlife Refuges are also consistently used. Hawksbill sea turtles have historically been documented nesting within the Marquesas Keys during the winter months. The Quicksands area west of the Marquesas Keys, Mooney Harbor within Marquesas Keys, and the Lakes Passage have all been found to be important foraging grounds for green, loggerhead, and hawksbill sea turtles due to availability of continuous seagrass beds at a range of water depths that provide a principal food source (Inwater 2008).

Crocodiles

The American crocodile (*Crocodylus acutus*) historically occurred throughout mangrove and estuarine areas of South Florida, including the Florida Keys, and is listed as federally endangered. Worldwide, American crocodiles are found throughout the Caribbean Sea and Central and South America along the Pacific and Atlantic coasts (Thorbjarnarson et al. 2010). Crocodiles forage opportunistically for fish, snakes, crabs, turtles, birds, and small mammals (Ogden 1978). Crocodiles bask in the sun during the daytime in cooler months and spend warmer months in shaded areas or underground dens.

4.2.2.3 Non-native species

Non-native species are present in the marine, nearshore, and terrestrial environments of the Florida Keys. They can be an environmental threat to living resources and habitats in FKNMS and in areas included in the potential boundary expansion alternatives.

Introduced species in the marine environment can impact the ecosystem in significant ways. Their presence can alter community composition, reduce the abundance and diversity of native marine species (Olden et al. 2004), interfere with ecosystem function, alter habitats, disrupt commercial and recreational activities, and in some instances cause extinction of native plants and animals (Clavero and Garcia-Berthou 2005). Introduced organisms can cause local extinction of native species either by preying on them directly or by outcompeting them for food or space. Once a breeding population is established, non-native species can be difficult, if not impossible, to eradicate. Invasions by non-native aquatic species are increasingly common worldwide in coastal habitats due to shipping traffic, world travel, and intentional or accidental releases by individuals.

Within the Florida Keys there are several efforts underway to monitor, eradicate, research, and conduct community outreach to address the issue of introduced species.

- REEF Early Detection/Rapid Response Program (Reef Environmental Education Foundation [REEF])
- REEF Exotic Species Sighting Program
- REEF Lionfish Invasion Program
- Mote Marine Laboratory C-OCEAN: Community-Based Observations of Coastal Ecosystems and Assessment Network
- FKNMS Lionfish Removal Permit Program
- FWC-FWRI targeted research on the extent, impact, and removal opportunities

The known fish, invertebrate, and reptile invasive species present in the Florida Keys include red lionfish (*Pterois volitans*), devil firefish (*Pterois miles*), peacock hind (*Cephalopholis argus*), sailfin tang

(*Zebrasoma veliferum*), orange cup coral (*Tubastraea coccinea*), Asian tiger shrimp (*Penaeus monodon*), giant foam oyster (*Hyotissa hyotis*), gryphaeid oyster (*Hyotissa mcgintyi*), gastropod (*Cyclothyca pacei*), worm-snail (*Thylacodes vandyensis*), green mussel (*Perna viridis*), veined rapa whelk (*Rapana venosa*), green iguana (*Iguana iguana*), spiny-tailed iguana (*Ctenosaura* spp.), and Burmese (*Python molurus bivittatus*) and other invasive python species.

For more information on the invasive lionfish, orange cup coral, invasive mollusks, and plant species that can affect sanctuary resources and management see Schofield 2009 and 2010, Ruttenberg et al. 2012, Green and Côté 2009, Morris and Whitfield 2009, Whitfield et al. 2007, Glynn et al. 2008, Cairns 2000, Riul 2013, Vermeij 2006, Lages et al. 2010, Shearer 2009, Mikkelsen and Bieler 2007, and Bieler et al. 2017.

4.2.3 Protected species and habitats

4.2.3.1 Endangered Species Act

USFWS and NMFS jointly administer the Endangered Species Act of 1973, as amended (ESA) (16 U.S.C. 1531 et seq.). USFWS manages the protection of and recovery effort for listed terrestrial and freshwater species, and NMFS manages the protection of and recovery effort for listed marine and anadromous species.

The ESA protects plant, fish, and wildlife species (and their habitats) that are listed as endangered and threatened. A species is defined as endangered if it is at risk of extinction throughout all or a significant part of its range. A threatened species is one that is likely to become endangered in the near future, and a species of special concern has received this classification based on either unfavorable regional factors or a decline in population (Owre 1990). The ESA requires federal agencies to consult with USFWS and/or NMFS, as applicable, before initiating any action that may affect a listed species.

Action area

The action area for purposes of Endangered Species Act analysis for effects of the proposed actions would be the entire Florida Keys region in Monroe County, Florida, including the mainland shoreline of Card and Barnes Sounds in Miami-Dade County and the Pulley Ridge area.

The implementing regulations for Section 7(a)(2) of the ESA state, “action area means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action” (50 C.F.R. § 402.02). The action area effectively bounds the analysis of ESA-protected species and habitats because only species that occur within the action area may be affected by the federal action.

For the purposes of the ESA analysis for the proposed expansion of FKNMS, ONMS defines the action area as:

- (1) the proposed boundaries of the expanded FKNMS;
- (2) shorelines, wetlands, and mangroves adjacent to FKNMS where noise from recreational and other activities would be audible to birds and wildlife; and
- (3) the main routes vessels would travel to operate within the sanctuary and recreational boats would travel to visit diving, snorkeling, or other sites within FKNMS.

NOAA expects all direct and indirect effects of the proposed action to be contained within the action area as defined above. NOAA recognizes that while the action area is stationary, federally listed species can move in and out of the action area. For instance, a migratory bird species could occur in the action area seasonally as it forages or breeds at or near FKNMS. Thus, in its analysis, NOAA considered not only those species known to occur directly within the action area, but also those species that may passively or actively move into the action area for limited periods of time. NOAA then considered whether the life history of each species makes the species likely to move into the action area where it could then be affected by the proposed action.

Listed species that may occur within the action area

NOAA used the USFWS Environmental Conservation Online System (ECOS) Information for Planning and Conservation (IPaC) tool to search for federally listed endangered or threatened species that may be present in the action area. The ECOS IPaC tool identified 55 species federally listed as endangered or threatened and under USFWS jurisdiction that could occur in the action area (FWS 2019). Designated critical habitat for nine species occur within the action area (USFWS 2019). The proposed action may have an effect on 30 of these ESA listed species, because the ivory billed woodpecker is likely extinct and the action would not affect terrestrial plants.

Appendix E describes the habitat requirements, occurrence patterns, and federal status for each of the 30 listed species. NOAA reviewed the occurrence patterns for the 30 species and compared the habitat requirements for each species to the available habitat within the action area to determine which species could occur within the action area.

To compile the list of NMFS protected species, NOAA used the NMFS Southeast Regional Office Protected Resource Division's threatened and endangered species lists for Florida's Atlantic and Gulf coasts on May 16, 2019. These lists comprise 26 species, of which three (Atlantic sturgeon, shortnose sturgeon, and Johnson's seagrass) are not believed to exist in the sanctuary. On June 24, 2019, NMFS concurred with the list of species that may occur within the action area based on a technical assistance meeting between NMFS and ONMS.

The protected status of each species under USFWS and NMFS jurisdiction is summarized in Appendix E. Additionally, below are brief descriptions of the listed species most likely to occur within the Florida Keys action area.

Plants

No marine plants within the study area are currently listed as federal threatened or endangered species. However, the threatened Johnson's seagrass can be found in waters of Biscayne Bay adjacent to the sanctuary. Several terrestrial plants found within coastal rock barren and beach berm communities are listed as federal threatened or endangered species, including Cape Sable thoroughwort (endangered; *Eupatorium frustratum*), Garber's spurge (threatened; *Chamaesyce garberi*), and Blodgett's silverbush (threatened; *Argythamnia blodgettii*). About 25 populations of *E. frustratum* remain, and are particularly susceptible to disturbance and habitat loss due to sea level rise. Because these plants do not occur within the action area, which is limited to marine waters for any direct disturbances, these species are not considered in further detail within this DEIS.

Animals

Marine invertebrates

There are seven coral species within the Florida Keys that are threatened under the ESA. The two Acroporid coral species (elkhorn and staghorn) were listed in 2006 and five additional species were listed in 2014.

Elkhorn and staghorn coral

Elkhorn (*Acropora palmata*) and staghorn (*A. cervicornis*) corals were listed as threatened under the ESA on May 9, 2006 (NMFS 2006). Elkhorn and staghorn corals were once the most abundant and important species on Atlantic/Caribbean coral reefs in terms of building reef structure. Both elkhorn and staghorn corals underwent precipitous declines in abundance throughout their ranges in the 1970s and 1980s, with losses of up to 95 percent. White band disease is the main factor for their near demise, with additional losses from disease, bleaching, hurricanes, and predation in the 1990s and 2000s. The significant reduction in the density of these species affects their role as a habitat forming coral and also may reduce the likelihood of natural recovery, as their ability to successfully reproduce is greatly diminished. Although disease was the primary cause of the initial decline, elevated seawater temperatures and ocean acidification associated with climate change are credible and potentially significant impediments to recovery of these species (NMFS 2015).

Pillar coral (Dendrogyra cylindrus)

NMFS listed pillar coral as threatened under the ESA on September 10, 2014. It has historically been found throughout the Caribbean and off the southeast coast of Florida, but is generally uncommon. Recent reports indicate that it may be locally extinct off southeast Florida. It usually occurs as scattered, isolated colonies, although a few small aggregations historically occurred in the Florida Keys. Beginning in 2014, an extensive study was undertaken to identify locations with colonies; assess the size, abundance, and condition of these colonies; and determine their genetic makeup. Population assessments from February 2017 documented 78 remaining genotypes (represented by 257 live colonies), which represents a loss of 48 percent of genotypes and 64 percent of colonies from the baseline surveys in 2014. The low abundance and infrequent encounter rate make it difficult to determine population trends (NMFS 2015).

Rough cactus coral (Mycetophyllia ferox)

NMFS listed rough cactus coral as threatened under the ESA on September 10, 2014. It occurs in southeast Florida and throughout the greater Caribbean. It is one of the least common coral species observed in monitoring studies. Low encounter rate and percent cover coupled with the tendency to survey *Mycetophyllia spp.* at the genus level make it difficult to discern population trends from monitoring data. Available data indicate *M. ferox* has experienced significant declines in Florida (NMFS 2015).

Lobed star coral (Orbicella annularis), mountainous star coral (Orbicella faveolata), and boulder star coral (Orbicella franksi)

NMFS listed the star corals in the *Orbicella* species complex as threatened under the ESA on September 10, 2014. The star corals historically dominated coral reefs throughout the Caribbean both by abundance and cover in areas outside of elkhorn coral habitats. They formed dense assemblages of large, centuries-old colonies interspersed with few small colonies (Bruckner 2012). Bleaching and coral diseases have caused major declines of these over the last twenty years, and in many locations they are now rare.

Fortunately, in some Florida Keys locations, especially in mid-channel and nearshore patch reefs, populations of these species have been stable or have suffered minimal losses.

Terrestrial invertebrates

Miami blue butterfly (Cyclargus thomasi bethunbakeri)

The federally endangered Miami blue butterfly is a brightly colored subspecies of blue butterfly primarily found using beachside scrub in the lower Florida Keys. This population once spanned the southern Florida coast and the Florida Keys and is now constricted to six islands in Key West National Wildlife Refuge and one island in Great White Heron National Wildlife Refuge. USFWS listed the butterfly as an endangered species in 2012 (USFWS 2012). Potential threats include habitat loss, degradation and fragmentation, group isolation, mortality, and invasive species. This subspecies is now vulnerable to extinction from large storms and hurricanes due to its small range. Mosquito control efforts using pesticides have been implicated in the decline of the subspecies; however, areas untreated by these pesticides have also experienced a dramatic decline (Zhong et al. 2009). This butterfly primarily uses beach ridge habitats on Marquesas and Boca Grande keys. Since the Miami blue has poor dispersal abilities (Emmel and Daniels 2003), nectar sources must be near host plants, which can be found within the coastal prairie communities located on select islands. Peak abundance on the Marquesas Keys is generally during spring and fall, but is likely linked to precipitation events (Henry and Haddad 2013).

Stock Island tree snail (Orthalicus reses)

Stock Island tree snails are found in hardwood hammocks in the Florida Keys. The snail historically occurred on Stock Island and Key West, where it was virtually eliminated. Habitat loss and a major decline in the original Stock Island population led snail collectors to move snails to other hammocks throughout the Florida Keys. The translocation of snails successfully prevented extinction of the species, but several of the few remaining populations are at risk due to continuing habitat loss to development. The National Key Deer Refuge contains one of the last established populations of this snail. Strategies for protecting hardwood hammocks will benefit the Stock Island tree snail.

Fishes

Nassau grouper (Epinephelus striatus)

The Nassau grouper is a shallow-water grouper species that has supported fisheries throughout the wider Caribbean, South Florida, Bermuda, and the Bahamas (Carter et al. 1994). On June 29, 2016, NMFS published a final rule (81 FR 42268) listing Nassau grouper as threatened under the ESA.

Smalltooth sawfish (Pristis pectinata)

Smalltooth sawfish belong to a group of fish called elasmobranchs, whose skeletons are made of cartilage, like sharks, skates, and rays. Most sawfish species take a long time to mature. This low reproductive potential, historical bycatch, and trophy fishing (for the saw [i.e., rostrum]) of sawfish has led to the endangered status of smalltooth sawfish. The smalltooth sawfish’s historical range spanned from New York to Brazil. The U.S. distinct population is now only present in Florida and has been reported in both Atlantic and Gulf areas of the sanctuary.

Oceanic whitetip shark (Carcharhinus longimanus)

The oceanic whitetip shark was listed by NMFS as threatened under ESA during 2018. This species experienced declines in population size including an 88 percent decline in the Gulf of Mexico due to commercial fishing. Given their life history traits, particularly their late age of maturity and low reproductive output, oceanic whitetip sharks are inherently vulnerable to depletions, with low likelihood

of recovery. Additional research is needed to better understand the population structure and abundance of the oceanic whitetip shark.

Giant manta ray (Manta birostris)

The giant manta ray was listed as threatened under the ESA by NMFS in 2018. It is the world’s largest ray, with a wingspan of up to 29 feet (8.8 m). They are filter feeders and eat large quantities of zooplankton. Giant manta rays are slow-growing, migratory animals with small, highly fragmented populations that are sparsely distributed across the world. The main threat to the giant manta ray is commercial fishing, with the species both targeted and caught as bycatch in a number of global fisheries throughout its range. Manta rays are particularly valued for their gill rakers, which are traded internationally.

Amphibians and reptiles

Green sea turtle (Chelonia mydas)

The Florida breeding population of green sea turtles is federally threatened. This large sea turtle inhabits marine coastal and oceanic waters and occurs in Florida year-round. There is evidence that green sea turtles using the Florida Keys are genetically a separate population from the mainland Florida population (Shamblin et al. 2014). Nesting has been documented on several beaches in Key West National Wildlife Refuge: Boca Grande Key, Sawyer Key, and three beaches in the Marquesas Keys. Nest numbers have remained stable on Boca Grande and Sawyer Keys since 1990, despite progressive degradation of nesting habitat from wave action caused by storm events and boat traffic. Climate change effects, such as sea level rise and more frequent storms, could have a substantial impact on nesting habitat for sea turtles.

Hawksbill sea turtle (Eretmochelys imbricata)

The hawksbill sea turtle is endangered throughout its range. This small-to-medium-sized sea turtle is found throughout Key West National Wildlife Refuge in hardbottom and reef habitats containing sponges. Nesting is rare and has only been documented once on Boca Grande Key and several times in the Marquesas Keys. On the latter island, nesting has been restricted to the fall and winter months. Genetic analyses of hawksbills in Key West National Wildlife Refuge indicated that the refuge serves as developmental habitat for juveniles originating from both the Mexican and Cuban nesting aggregations (Gorham et al. 2014).

Kemp’s ridley sea turtle (Lepidochelys kempii)

The Kemp’s ridley sea turtle is endangered throughout its range. It is a small-to-medium-sized turtle with a nearly circular shell. Primarily a Gulf of Mexico species, it inhabits marine coastal waters with sand or mud bottoms. Juveniles frequent bays. Nesting occurs on Gulf beaches in south Texas and northern Mexico, although a few nests have been confirmed in Florida. Data are lacking on this species, but it likely occurs at least sporadically in the waters of the sanctuary and within the boundaries of the Lower Florida Keys National Wildlife Refuges.

Leatherback sea turtle (Dermochelys coriacea)

The leatherback sea turtle is endangered throughout its range. It is the largest sea turtle species found in the Florida Keys, weighing 600 to 1,100 lbs (272-499 kg) and inhabiting marine coastal and oceanic waters. They feed exclusively on jellyfish. Nesting activity was documented at Bahia Honda State Park in 2016.

Loggerhead sea turtle (Caretta caretta)

Threatened. Loggerhead sea turtles inhabit marine coastal and oceanic waters and are present in Florida year-round. Nesting occurs in Key West National Wildlife Refuge on Woman, Boca Grande, and the Marquesas keys; on Sawyer Key and West Content Keys in Great White Heron National Wildlife Refuge; and on Big Pine Key and Ohio Key in National Key Deer Refuge. A peak of 81 nests were found in Key West National Wildlife Refuge in 1995, but annual loggerhead nesting activity has ranged from 17 to 73 nests between 2006 and 2016 (Watts pers. comm. 2015-2018).

American crocodile (Crocodylus acutus)

American crocodiles historically occurred throughout mangrove and estuarine areas of South Florida, including the Florida Keys. Worldwide, American crocodiles are found throughout the Caribbean Sea and Central and South America along the Pacific and Atlantic coasts (Thorbjarnarson et al. 2010). In the United States, the American crocodile is federally listed as a threatened species after being down-listed from endangered in 2007. Areas that contain breeding populations include Crocodile Lake National Wildlife Refuge, Turkey Point Power Plant cooling canals, and Everglades National Park. Increasingly, there is also evidence of nesting on areas further south in the Florida Keys and an overall increase in population size over the last few decades (Cherkiss et al. 2011). The American crocodile is typically active from shortly before sunset to shortly after sunrise (Mazzotti 1983, Mazzotti et al. 2003). Crocodiles forage opportunistically for fish, snakes, crabs, turtles, birds, and small mammals (Ogden 1978). Crocodiles bask in the sun during the day in cooler months and spend warmer months in shaded areas or underground dens. Habitat fragmentation, sea level rise, and vehicle collisions are thought to be the greatest anthropogenic threat to American crocodiles.

Birds***Roseate tern (Sterna dougallii)***

The North American subspecies of the roseate tern is a colonial nesting seabird found along the East Coast of North America. In South Florida, roseate terns typically nest on open sandy islands, dredge-spoils and rooftops, using open sand, broken coral, or rocky cliffs as nesting substrate. They typically select flat ledges for nesting, and will lay their eggs directly on the ground beginning in May. These birds are susceptible to human disturbance during nesting and rearing of young, as well as to predation, storms, flooding, and tidal inundation. Climate change impacts, such as sea level rise and the erosion of sandy islands, may reduce the availability of suitable breeding habitat. Rooftop nesting occurs in areas where sandy nesting habitats are unavailable or heavily disturbed, leading to a suite of potential human disturbance and urban predation issues. Roseate terns forage over shallow coastal waters and offshore seas, feeding primarily on small, schooling fish such as herring (Clupeidae), young mackerel (Scombridae), and small squid (Teuthoidea) (Nisbet 1981, Duffy 1986, Kirkham and Nisbet 1987). Roseates will hover over schools of fish at heights of up to 65 feet (20 m) (USFWS 1989), and plunge-dive to catch the fish, sometimes completely submerging their bodies in the water.

Piping plover (Charadrius melodus)

This small, sandy-colored shorebird is primarily found along the sandy beaches of the Atlantic coastline. Piping plovers winter along the coast from North Carolina to Florida, as well as in the Bahamas and West Indies, using open, sandy beaches, sand flats, and tidal mudflats for foraging, roosting, and loafing. This species has been federally- and state-listed as threatened, and recovery efforts are geared toward minimizing disturbance to their breeding and wintering areas. Piping plovers use beaches, as well as tidal sand and mudflats for foraging in the Florida Keys during winter months. Their diet includes polychaete

marine worms, crustaceans, insects, and bivalve mollusks (Nicholls 1989), found on top of or just beneath the surface of moist or wet sand, mud, or shell. Due to the nature of their habitat use, they are susceptible to human disturbance. Increased use of beaches and tidal flats for recreation is of primary concern. Wintering piping plovers use a variety of habitat patches during fall through spring, moving among them according to changes in tide and weather. Protecting these habitat patches from disturbance is important to ensure that plovers are healthy when they begin their spring migration toward breeding grounds from March to May.

Great white heron (Ardea herodias occidentalis)

Great white herons nest in South Florida, primarily in the Florida Keys. Recent evidence shows that this heron is either a sub-species or separate species from the great blue heron (*Ardea herodias*; McGuire 2001). Nesting occurs on select mangrove islands throughout the year, with a pronounced peak between November and February. Birds forage on small fish species such as pipefish (Syngnathidae) and needlefish (*Strongylura spp.*) and on large, intact turtle grass (*Thalassia testudinum*) beds during a limited fraction of the tidal cycle (Stevenson and Anderson 1994). Foraging herons have high site fidelity and select seagrass meadows that are continuous with few patches. Destruction of seagrass beds by boating impacts can directly limit the availability and quality of forage habitat for these birds (Meyer and Kent 2011). A peak of 336 nests was documented in 1998, but thereafter nesting declined annually to less than 100 (Wilmsers 2003). Historically, about 40 mangrove islands within the Lower Keys Refuges have been used as rookeries for great white herons (Wilmsers 2010), and the Lower Keys support over 25 percent of the Florida population (Meyer and Kent 2011).

White-crowned pigeon (Patagioenas leucocephala)

The white-crowned pigeon is a large, slate-gray bird with a conspicuous white crown and an iridescent green scaled nape. The distribution of the white-crowned pigeon ranges from South Florida through the West Indies and the Caribbean coast of the Yucatan Peninsula. This species is federally listed as near-threatened and state listed as threatened. Nesting colonies are primarily found on isolated mangrove islands from May through September. White-crowned pigeons primarily forage in upland hammock trees with a diet consisting of mainly fruits and berries, including poisonwood (*Metopium toxiferum*), found in low-lying forests on larger islands. Both the nesting and substantial foraging habitats with three to 15 miles (4.8-24 km) are needed by this species to survive (Bancroft and Bowman 2001). All three Lower Keys Refuges serve as key areas for both nesting and foraging.

Magnificent frigatebird (Fregata magnificens)

The magnificent frigatebird is a large seabird that occurs along the Pacific and Atlantic coasts of North and South America, as well as the Caribbean Basin. Nesting habitat in Florida has been on select islands or clusters of red mangroves, where birds build platforms from gathered sticks at ground level or elevated in trees. Nesting on the Marquesas Keys was first confirmed in 1969 as the only known nesting colony in the United States, and was documented annually until this colony was abandoned in 1989. Magnificent frigatebirds are still present in the Florida Keys; however, due to an extensive time investment in breeding, human disturbance can greatly influence both colony site selection and nesting success. Magnificent frigatebirds feed by selecting prey from the surface of the sea, mainly fish, squid, jellyfish, and crustaceans (Calixto-Albarran and Osorno 2000). They are unable to land on water or dive under the surface, as they are incapable of flying when wet. Due to this limitation, they have adapted alternative feeding strategies, such as kleptoparasitism, forcing smaller seabirds to drop their catch or regurgitate food for their benefit.

Reddish egret (*Egretta rufescens*)

The reddish egret is a medium to large long-legged heron found in two color phases: dark phase, consisting of a dark gray body and reddish neck, and white phase, consisting of a white body with a two-toned bill and dark grey legs. This species almost disappeared due to the millinery trade in the late 1800s. The population in Florida is 300 pairs (Green 2006), with many of those birds found in the Florida Keys. This species is often identified by their specialized feeding behavior, which consists of running through shallow water, leaping sideways, and spastically changing directions. They also curve their wings to cast shade over the water in an effort to lure prey fish toward them. Reddish egrets are restricted by the availability of broad, saline coastal flats with considerable tidal flow (Paul 1991), and can become territorial over high quality foraging grounds. One of the most important foraging areas for this species in Key West National Wildlife Refuge is on Boca Grande Key.

Mammals**Cetaceans**

Endangered cetaceans that may occur in the area under consideration include blue whales, fin whales, sei whales, sperm whales, North Atlantic right whales, and Bryde's whales. Blue whales (*Balaenoptera musculus*) are the largest animals ever to live on our planet. They feed almost exclusively on krill, straining huge volumes of ocean water through their baleen plates (which are like the teeth of a comb). Blue whales are found in all ocean basins except the Arctic Ocean. They sometimes swim in small groups but usually are alone or in pairs. They generally spend summers feeding in polar waters and undertake lengthy migrations towards the equator as winter arrives. Fin whales (*Balaenoptera physalus*) may winter in the area, primarily in offshore waters, and feed on small schooling fishes, pelagic crustaceans, and squid (NMFS 1989). Sei whales (*Balaenoptera borealis*) may occur in the area and generally skim feed on surface plankton, small schooling fishes, and squid. These baleen whale species are all opportunistic feeders and may feed at or near the surface (McKenzie and Nicolas, 1988).

One endangered odontocete, the sperm whale (*Physeter macrocephalus*), may occur in the area and is most likely to be found at the edge of the continental shelf or in deep oceanic waters. They tend to inhabit areas with a water depth of 1968 feet (600 m) or more and are uncommon in waters less than 984 feet (300 m) deep. Sperm whales are deep diving and feed primarily on squid and deep-water fishes.

Bryde's whales (*Balaenoptera edeni*) are found in warm, temperate oceans including the Atlantic, Indian, and Pacific. Some populations of Bryde's whales migrate with the seasons, while others do not migrate, making them unique among other migrating baleen whales. Bryde's whales are vulnerable to many stressors and threats, including vessel strikes, ocean noise, and whaling outside the United States. The Gulf of Mexico subspecies is also threatened by oil and gas activities, as well as oil spills and cleanup. Scientists believe that there are fewer than 100 Gulf of Mexico Bryde's whales.

West Indian manatee (*Trichechus manatus*)

Manatees are found in marine, estuarine, and freshwater environments. These herbivores feed opportunistically on a wide variety of marine, estuarine, and freshwater plants, including submerged, floating, and emergent vegetation. Florida manatees are rare in the Lower Florida Keys National Wildlife Refuges, partly because freshwater outflows into the nearshore marine waters are lacking.

Key deer (*Odocoileus virginianus clavium*)

The Key deer is the smallest subspecies of the North American white-tailed deer (*O. virginianus*). It historically ranged from Key Vaca to Key West, but the current range includes approximately 26 islands

from Big Pine Key to Sugarloaf Key, with the center of its population on Big Pine and No-Name keys. Most lands within its current range, including privately owned lands, lie within the administrative boundaries of National Key Deer Refuge. Key deer use all cover types, including those normally above tidal influence (pine rockland, hardwood hammock, freshwater wetlands), as well as tidally influenced types (mangrove, salt marsh transition). They also use residential areas extensively where they feed on ornamental plants and grasses and seek freshwater. The Key deer remains listed as endangered due to its restricted range, sea level rise, habitat fragmentation, and high human-related mortalities and disturbances.

Lower Keys marsh rabbit (Sylvilagus palustris)

The Lower Keys marsh rabbit is a subspecies of the marsh rabbit, which is more widely distributed in the southeastern United States. This subspecies originally ranged throughout the Lower Florida Keys, including Key West. The current range appears to consist of three separate metapopulations: the Boca Chica area (Boca Chica, Geiger, East Rockland and Saddlehill keys), the Sugarloaf area (Sugarloaf and Saddlebunch keys), and the Big Pine area (Big Pine, Annette, East Water, Howe, Johnson, Little Pine, Mayo, Newfound Harbor, Porpoise, and No Name keys) (Forys and Humphrey 1999). Lower Keys marsh rabbits are predominantly found in salt marsh transition communities that have dense ground cover created by cordgrass (*Spartina spartinae*).

Silver rice rat (Oryzomys palustris natator)

The silver rice rat is primarily a nocturnal, semi-aquatic, wetland rodent that forages in intertidal zones, feeding on fish, crabs, grasses, and forbs (Perry et al. 2005). Compared to other small mammals, silver rice rats inhabit large home range areas of five to 27 acres (2-11 hectares) (Mitchell 1996). Its habitat includes areas of contiguous mangrove swamps and salt marsh transition. Populations are found at extremely low densities on at least 13 islands, ranging from Big Pine Key to the Saddlebunch Keys. Silver rice rats were listed as endangered due to habitat destruction from human development. Loss of mangrove habitats was greatly curtailed after the passage of the Clean Water Act of 1974 that restricted development in wetlands; however, threats due to sea level rise and competition from black rats are emerging concerns for silver rice rat conservation.

Designated critical habitat

When a species is listed under the ESA, NMFS and/or USFWS is required to determine whether there are areas that meet the definition of “critical habitat.” Critical habitat for a threatened or endangered species is defined as (1) the specific areas within the geographical area occupied by the species at the time of listing that contain physical or biological features essential to conservation of the species and that may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation (16 U.S.C. § 1532(5)(A)).

Critical habitat within FKNMS has been designated for the following species: loggerhead sea turtle (79 Fed. Reg. 39855), smalltooth sawfish (74 Fed. Reg. 45353), elkhorn and staghorn coral (73 Fed. Reg. 72210), American crocodile (42 Fed. Reg. 47840), Bartram’s hairstreak butterfly (*Strymon acis bartrami*, 79 Fed. Reg. 47179), Cape Sable thoroughwort (79 Fed. Reg. 1551), Florida leafwing butterfly (*Anaea troglodyta floridalis*, 79 Fed. Reg. 47179), Florida semaphore cactus (*Consolea corallicola*, 81 Fed. Reg. 3865), piping plover (74 Fed. Reg. 23476), silver rice rat (58 Fed. Reg. 46030), and West Indian manatee (42 Fed. Reg. 47840).

4.2.3.2 State listed species

In accordance with Chapter 68A-27 of the Florida Administrative Code, FWC oversees the state's Threatened and Endangered Species Conservation Program. This chapter of the Florida Administrative Code gives the FWC the authority to list species as state-threatened or endangered; to issue regulations necessary and advisable to provide for the conservation of such species; and to prohibit anyone from taking a species, which includes activities that would harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in such conduct.

The state of Florida defines all listed species as imperiled, which includes species listed at the federal level as endangered, threatened, threatened due to similarity of appearance, or non-essential experimental by USFWS and NMFS. It also includes species listed at the state level as state-designated threatened and species of special concern by FWC. State-designated Threatened species are not federally listed but at risk of extinction. Species of special concern are those that require review so they can be either designated as state-designated threatened or given a management plan and be removed from the list. For the complete list of imperiled species, see Appendix E.

4.2.3.3 Essential Fish Habitat

Essential Fish Habitat (EFH) is defined under the MSA as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity.” EFH is designated in fishery management plans developed by the regional fishery management councils. EFH within FKNMS has been designated for 38 species or species complexes (i.e., snapper-grouper complex). For each species or complex, the fishery management councils have identified life stages of these species that have been identified in this area. Some species such as blue marlin and shortfin mako shark have EFH designated for all life stages. For designated EFH species or complexes within FKNMS, see Appendix E.

4.2.3.4 Migratory birds

USFWS administers the Migratory Bird Treaty Act, which prohibits anyone from taking native migratory birds or their eggs, feathers, or nests. Regulations under the Migratory Bird Treaty Act define “take” as “to pursue, hunt, shoot, wound, kill, trap, capture, or collect” (50 C.F.R. § 10.12). The act protects a total of 1,007 migratory bird species (75 Fed. Reg. 9282). USFWS stated that 56 migratory birds of concern may occur in or near FKNMS (Appendix E).

4.3 Physical resources

This section addresses the physical environments including air quality, climate, hydrology, hydrography/oceanography, and water quality issues related to the proposed action and alternatives. The study area for physical resources includes the existing FKNMS and a much larger region in the Gulf of Mexico and Straits of Florida that is connected through currents and other physical oceanographic features.

4.3.1 Climate

Impacts from global climate change directly affect the natural resources of the Florida Keys. The key climate change impacts of concern for FKNMS, national wildlife refuges, and adjacent waters include ocean warming, ocean acidification, changes in weather and storm patterns, and sea level rise.

The Florida Keys lie in the subtropics, between latitude 24° 30' and 25° 30' North. As such, the sun's rays strike Earth at a greater angle in the Florida Keys than anywhere else in Florida (Winsberg 2003). In

addition, the Keys are the sunniest region in Florida, with 76 percent possible sunshine during an average year. Moreover, the nearness of the Florida Keys to the Gulf of Mexico and Straits of Florida provides a tempering effect on temperatures year-round. The average temperature during the coldest month (January) is only 14° F (10° C) lower than during the warmest month (July). However, temperatures as low as 35° F (1.7° C) have been recorded at John Pennekamp State Park (in January 2010). Diurnal variations in temperature throughout the year average only about 10° F (5.6° C). The Florida Keys region is the driest in Florida, and significant stretches of dry weather have occurred, especially during the winter and spring months, but also occasionally during the summer. Long stretches of dry, sunny weather occurring during the summer in combination with light winds can stress marine ecosystems by raising sea surface temperatures and salinity concentrations (Voss 1988).

Warming seas are affecting coral reefs by causing mass coral bleaching events, while ocean acidification is likely causing slower growth of coral skeletons (Hoegh-Guldberg et al. 2007, De'ath et al. 2009). Bleaching and infectious disease outbreaks are likely to be more frequent and severe as temperatures rise, increasing coral mortality. Climate changes could have other impacts on marine systems such as sea level rise; altered frequency, intensity, and distribution of tropical storms; and altered ocean circulation, with its effects on water mass distribution, larval connectivity, and productivity. All of these impacts may combine, often synergistically, to affect important ecosystem functions and reduce biodiversity (NOAA CRCP 2009).

Climate observations, critical to understand and monitor changing ocean and atmospheric conditions, are based on direct measurements and remote sensing from satellites. Several studies and programs have been conducted or are in place to understand and monitor these changing conditions. Beginning in 1989, the SEAKEYS (Sustained Ecological Research Related to Management of the Florida Keys Seascape) Network was initiated to collect oceanographic data to supplement the primarily meteorological data being collected by the Coastal Marine Automated Network (C-MAN). As part of this program, the sanctuary deployed thermographs in strategic areas throughout the reef tract to record long-term water temperatures. While the specific SEAKEYS project is no longer active, NOAA regularly collects ocean temperature data throughout the Florida Keys at a range of depth gradients, and the Molasses Reef C-MAN station continues to collect surface sea temperatures in near real time. Ocean acidification data are collected by the Moored Autonomous pCO₂ buoy (MAP-CO₂) at Cheeca Rocks, offshore Islamorada. Satellite data provide near real time sea surface temperature data that can be used to identify areas at risk for coral bleaching. NOAA's Coral Reef Watch Program releases hot spot, degree heating week, and bleaching alert area products in advance of and throughout the season when bleaching is most possible.

4.3.1.1 Water temperature

Data from both satellite and *in situ* instruments show sea surface temperature increases in the Florida Keys, which is a contributing factor of coral bleaching and some diseases. Temperature data from NOAA's C-MAN station at Molasses Reef in FKNMS show that these warming trends continue. Data indicate that the summers of 2014 and 2015 and the winter of 2013 to 2014 were the warmest on record (since 1988). The oldest known *in situ* temperature record of any coral reef in the Florida Keys is from Hens and Chickens Reef, which showed significant warming from 1975 to 2014, indicating that thermal stress to corals has increased appreciably over the past 40 years (Manzello 2015). This analysis predicts that coral bleaching events will become more frequent and severe over coming decades. The reef-building

corals of Florida are now exceeding their upper thermal limits regularly, with seven mass bleaching events since 1987 that have impacted the entire reef tract.

Increased sea-surface temperatures, reduced freshwater inputs, and increased nutrients can also contribute to episodic die-offs of seagrasses and other important components of coastal and marine communities. A seagrass die-off occurred in Florida Bay in 1987, impacting 9884 acres (40 km²) of seagrass (Hall et al. 2016) at the same time that a mass coral bleaching event was occurring throughout the Florida Keys and Caribbean. Florida Bay experienced another large-scale seagrass die-off in 2015 due to increased water temperatures, salinity, a stratified water column, and bottom water anoxia (lack of oxygen) (Hall et al. 2016).

The Florida Keys and marine environment have also experienced cold weather impacts. Cold fronts are common during the wintertime in the Florida Keys, with observations showing that most frontal passages have been followed by a short period of cool weather, followed by gradual warming due to the cool, post-frontal air masses modifying quickly during the transit over surrounding warm waters. However, on occasion, significant cold air outbreaks have reached as far south as the Florida Keys (e.g., January 1981 and January 2010). Such strong cold air outbreaks have delivered significant impacts to the Florida Keys marine environment. Shallow areas have experienced rapid decreases in sea surface temperature and increases in turbidity. In addition, both nutrient and salinity levels have been affected. During the particularly cold air outbreaks, fish and coral kills have occurred, with subsequent recovery taking several years or even decades (Voss 1988).

4.3.1.2 Ocean acidification

On a broader scale, carbon dioxide (CO₂) induced ocean acidification may also affect coral reefs in the Florida Keys as atmospheric carbon dioxide levels continue to increase. The ocean takes up around 25 percent of atmospheric CO₂ produced by humans through the burning of fossil fuels and land use changes. This uptake of CO₂ is already decreasing the concentration of the carbonate ion (CO₃²⁻) in sea water, which is a fundamental building block of the calcium carbonate (CaCO₃) skeletons of reef building corals. As ocean acidification increases and the concentration of carbonate ions declines, the rate at which corals build their hard skeletons slows, promoting the breakdown and dissolution of living and fossil coral reef frameworks. The acidity of seawater has increased by 30 percent since the beginning of the Industrial Revolution over 250 years ago, leading to a global decline of roughly 0.1 pH units, making the ocean less alkaline (Ocean Acidification Reference User Group 2009).

Due to the increased acidity of seawater, many of the animals and plants in the ocean that have calcium carbonate skeletons or shells, such as corals, may experience reduced growth or ability to generate hard shells. For example, in Australia's Great Barrier Reef, corals have already reduced their calcification rates, most likely in response to elevated water temperature and ocean acidification impacts (De'Ath et al. 2009). A study by Hoegh-Guldberg et al. (2007) predicts that if atmospheric CO₂ levels continue to increase, the structure and function of coral reef ecosystems around the world will be compromised and some coral species will become extinct. Ocean acidification could prompt a chain reaction of impacts through the marine food web, beginning with larval fish, shellfish, and corals, and cutting valuable ecosystem services provided by coral reefs such as food security, tourism, shoreline protection, and biodiversity (Ocean Acidification Reference User Group 2009).

To capture real-time data, scientists from NOAA's AOML installed a CO₂ monitoring buoy at Cheeca Rocks. Data from this instrument, along with continued monitoring of corals and coral health, enable resource managers to make informed decisions regarding reef management as it relates to ocean acidification.

See Section 4.2 for more information on coral and seagrass habitats.

4.3.1.3 Sea level rise

The threat of sea level rise profoundly affects the Florida Keys. The projections from NOAA's Office of Coastal Management indicate that Florida's sea level will rise from 3.84 to 8.56 feet (1.17 - 2.61 m) by the year 2100 (NOAA 2017). The seas in Florida have been rising about 0.1 inches (0.25 cm) per year (Florida Oceans and Coastal Council 2009). This could have a significant effect on the land of the Florida Keys, as the average elevation of the larger islands range from four to seven feet (1.2 to 2.1 m) above current sea levels (Evans and Bergh 2016). As a result, there may be significant flooding of property and infrastructure, greater vulnerability to storm surges and erosion, and destruction of coastal habitats and associated species. Rising seas will likely have direct impacts on coastal beaches, infrastructure, and freshwater wetlands due to high tides and storm surges. Sea level rise in South Florida is anticipated to outpace the global average due to ongoing variations in the Florida Current and Gulf Stream.

With its low-lying, elevation-dependent vegetation, the lower Florida Keys will have dramatic terrestrial impacts even at low (1 ft/0.3 m) levels of sea level rise. LaFever et al. (2007) found that various sea level rise scenarios (1-3 ft / 0.3-0.9 m estimated by IPCC 2001) resulted in loss of both coastal and upland vegetation structure as sea level rise challenged the ability of vegetation to migrate vertically. A recent Florida International University research study also found that South Florida mangrove forests would not be able to adapt to current sea level rise projections (Meeder and Parkinson 2018). Upland communities will decrease in area extent and fragment based on small differences in elevation. With the concomitant loss of both waterholes and freshwater marshes, the loss of freshwater would be an important limiting factor for many terrestrial wildlife species. With more recent projected sea level rise ranging from <1-6 ft/0.2-2.0 m (10 ft/3.0 m by some sources) by 2100 (Zhang et al. 2011, IPCC 2014, NASA 2017) the potential impact on the Lower Florida Keys is not precisely known but likely will be substantial.

Sea level rise is a major concern in conserving all wildlife habitats in the Florida Keys. Habitat shifts and loss have been documented across the Florida Keys, and when compounded with storm surges, can transform the hydrology, soils and vegetation communities (Alexander and Dickson 1972, Ross et al. 1994, Ross et al. 2009). Surface elevation tables were installed and monitored within National Key Deer Refuge to determine vertical accretion and subsidence rates within mangrove habitats (Hester 2011). Temporal changes in the salinity of freshwater lenses, the main freshwater source for plants and animals in the Lower Keys, highlighted the vulnerability of imperiled habitats such as pine rocklands and freshwater marsh to saltwater inundation (Ogurcak 2015).

4.3.1.4 Storm frequency and severity

While outside the scope of this DEIS, another potential impact of climate change are changes in the frequency and duration of weather events, including hurricanes. Higher intensity hurricanes have become more frequent. This trend is projected to continue, affecting the Keys as much as or more than any other part of the United States.

The Atlantic Basin Hurricane Season is the six-month period from June through November. Historically, most storms in the Florida Keys have occurred during the months of August, September, and October. However, hurricanes have affected the Florida Keys during every month of hurricane season.

Southern Florida has one of the highest tropical cyclone return periods in the United States (Blake et al. 2011). On average, there is an annual probability of about 20 to 25 percent of a hurricane passing within 75 miles (120.7 km) of a Florida Keys island community (Sheets and Williams 2001). The annual probability of a “major” hurricane (Category 3 or higher) passing within 75 miles of a Florida Keys community is about eight to 10 percent (Sheets and Williams 2001). Between 1950 and 2012, an average of 0.64 hurricanes per year have made landfall on the Eastern Seaboard of the United States; however, the number of landfalls in an individual year has varied across the range from zero to three (Yan et al. 2015).

Only three Category 5 hurricanes have made landfall in the United States since official hurricane records began in 1871. The Florida Keys Labor Day Storm of 1935 was one of these Category 5 storms, and to this day is the most intense hurricane ever to make landfall in the United States.

More recently, numerous tropical storm and hurricane impacts occurred in the Florida Keys during the hyperactive hurricane seasons of 2004, 2005, and 2017. Hurricane Wilma in October 2005 (see Kasper 2007) was noteworthy due to its historic storm surge, which caused widespread property damage throughout the Florida Keys. In 2017, Hurricane Irma made landfall at Cudjoe Key as a Category 4 storm producing water levels five to eight feet above ground level for portions of the Lower Keys (Cangialosi et al. 2018).

Both tropical storms and hurricanes have caused major damage to the Florida Keys' natural environment, with a single storm causing changes that would normally take years to occur. Tropical storm and hurricane impacts result from five hazards: (1) storm surge flooding; (2) damaging sustained winds; (3) tornadoes; (4) flooding rains; and (5) powerful waves, surf, and currents. Storm waves and currents can impact entire ecosystems, large blocks of coral can be broken from reefs and moved great distances, sediments can abrade corals or bury them completely, and entire islands can be defoliated. In addition, storm surges can flood aquifer recharge areas with saline water and soils can be completely eliminated (Monroe County Board of County Commissioners 1986). Recovery from such storms may take several decades (Nalvikin 1969).

Storm surge is the primary life-threatening hurricane hazard, and both historical evidence and modern computer models indicate that storm surge inundation has occurred and is likely to occur with all categories of hurricanes, and with some tropical storms.

At the landscape level, hurricanes have the potential to reshape shorelines, cause extensive damage to vegetation in forested areas, and change hydrological properties (Lopez et al. 2003). Previous researchers have posited that hurricane storm surge would likely salinize the freshwater sources in the Florida Keys for extended periods of time following hurricanes (Ross et al. 2009, Ogurcak 2015). Lopez et al. (2003) found that 27 percent of monitored fresh waterholes in the Lower Keys were too saline for wildlife after Hurricane Georges (1998) and remained so for weeks or months after the hurricane. Ogurcak (2015) reinforced the idea that storm surge has the most impact when she found that the extent of hurricane impacts and the associated recovery time was a function of elevation and community type. As such, hurricanes that cause extensive storm surge in addition to high winds are likely to cause lasting impacts on vegetative communities.

4.3.2 Air quality

The federal Clean Air Act was passed in order to protect human health and welfare from air pollution. As part of the Clean Air Act, National Ambient Air Quality Standards (NAAQS) were established. NAAQS are defined as levels of pollutants above which detrimental effects on human health or welfare may result. NAAQS have been established for six pollutants. These are: particulate matter (PM10 and PM2.5); sulfur dioxide; nitrogen dioxide; ozone; carbon monoxide; and lead.

In Florida, air quality designations are made at the county level. For the purpose of planning and maintaining ambient air quality under NAAQS, the EPA developed air quality control regions. Air quality control regions are intrastate or interstate areas that share a common airshed. Monroe County, the county in which the state waters of FKNMS lie, currently meets or exceeds the requirements for the NAAQS for all six pollutants.

4.3.3 Regional water quality and hydrology

The primary natural source of freshwater in the Florida Keys is rain. Historically, early settlers collected rain water in cisterns or used water from wells and solution holes that tapped the small, shallow freshwater lenses. These lenses form from fresh water held in the ground above sea level during the rainy season. During the past century, the pattern and intensity of freshwater flows in the Everglades wetlands to the estuaries of Florida Bay and Biscayne Bay have been significantly affected due to intense municipal and agricultural activities. Freshwater flows in South Florida are most notably affected due to construction of the Central and Southern Florida Project for Flood Control and Other Purposes. This surface water management project, which was designed by the U.S. Army Corps of Engineers (USACE) in the 1950s, uses an extensive system of canals, levees, and water control structures to drain land, provide flood protection, and regulate South Florida drinking and agricultural water supply. As a result, enormous volumes of freshwater originally intended for the Everglades and its estuaries have been drained, diverted, or stored in “conservation areas.” The resulting alteration of the natural freshwater cycle has interrupted the volume, timing, and method of freshwater delivery throughout South Florida and to Florida Bay. For example, changes in salinity levels, temperatures, and other factors, due primarily to reductions in freshwater inputs, have resulted in seagrass die-off, extensive phytoplankton blooms, and the loss of estuarine ecological function, including changes in the kinds of fish and invertebrates found in Florida Bay (Zieman 1999).

Restoration of water flows to the Everglades wetlands and Florida Bay is being undertaken as part of the Comprehensive Everglades Restoration Plan (CERP) in conjunction with the South Florida Water Management District (SFWMD).

For more information about the hydrology of South Florida and the Florida Keys, including specific information about national wildlife refuge areas, see USACE 2010 (https://www.evergladesrestoration.gov/content/cerpreports/cerp_2010_rpt_to_public.pdf), Folk et al. 1991, Hanson 1980, Langevin et al. 1998, and Wightman 1990.

4.3.3.1 Hydrography/oceanography

Hydrography and oceanography are the studies of the physical features of bodies of water and the physical and biological properties of the ocean, respectively. A region’s hydrography coupled with changes in salinity, temperature, and circulation can affect water quality and create avenues of physical

and biological connectivity in the ocean and nearshore environments. The nearshore and ocean area of the Florida Keys, including Pulley Ridge, are influenced by two main regional currents: the Gulf of Mexico Loop Current and the Florida Current (Figure 4.6). The variability of these currents in conjunction with local meteorology and surface runoff affects the nature of the water and its transport into and within the sanctuary. Tides and wind-driven currents also affect the movement of water in and around the Florida Keys.

Periodic changes in the locations of the Loop and Florida currents result in the formation of circulation gyres that affect both the transport and entrainment of sanctuary waters and its resources. These gyres potentially contribute to the nutrient and larval transport between the Loop Current and the Florida Keys system, and may also serve to retain coastal-derived larvae that would otherwise be carried away by the Florida Current (Cowen et al. 2006, Sale 2006). The combined physical processes in the area tend to form a recirculating retention and recruitment pathway for larvae either spawned in the Florida Keys or transported there from remote areas of the Gulf of Mexico and Caribbean Sea (Lee and Williams 1999). For species with larval stages ranging from days to several weeks, the variability in the conveyor belt circulation provides ample opportunity for recruitment (Lee and Williams 1999).

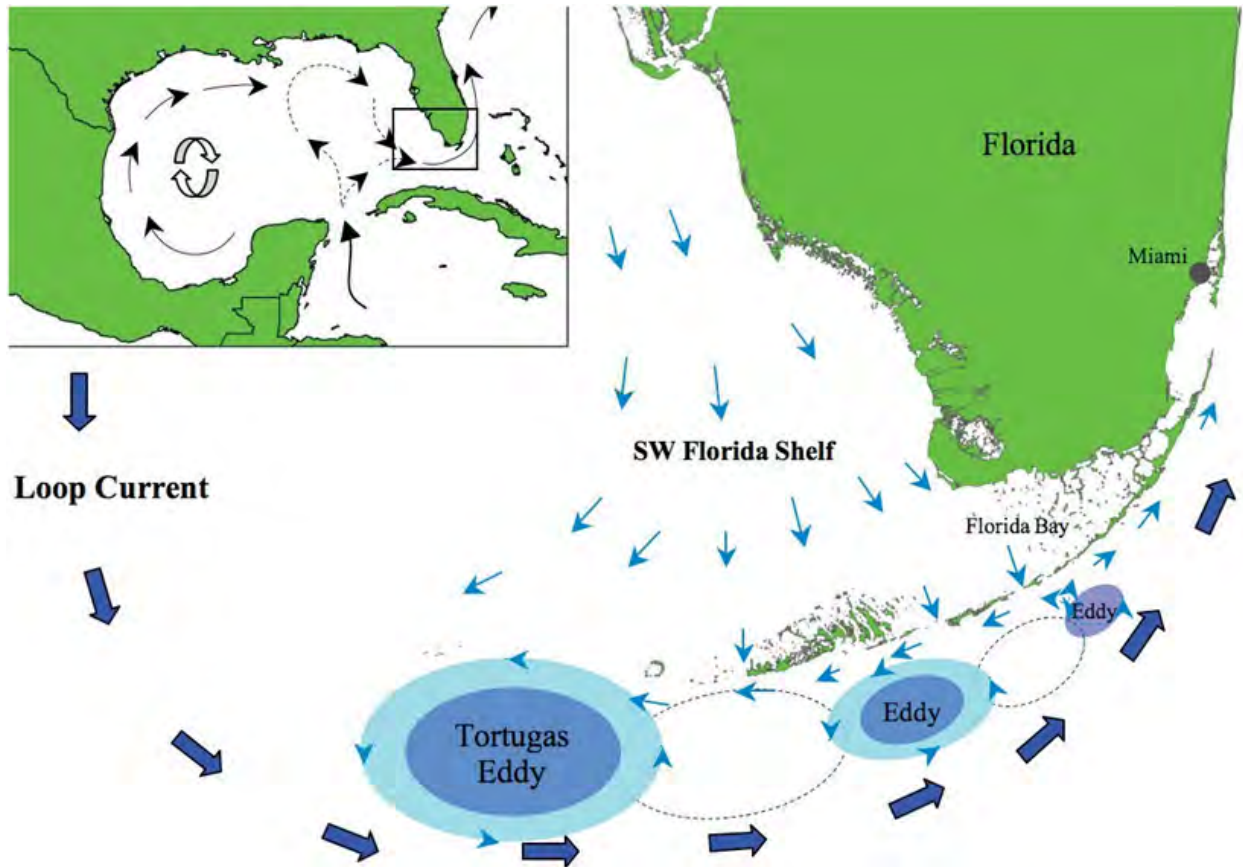


Figure 4.6. Regional currents affect Florida Keys waters and ecosystems. Image redrawn from Lee et. al. 2002

Ocean currents around South Florida drive important physical connectivity between the coral reefs of Pulley Ridge, the Dry Tortugas, the Florida Keys, and beyond. Pulley Ridge is dominated by the western edge of the Loop Current that brings relatively clear, warm, and nutrient-deficient water to the southern ridge. The proximity of Pulley Ridge to the Florida Keys, combined with the influence of the Loop

Current, has led scientists to research whether Pulley Ridge serves as an upstream source of invertebrate and fish larvae for the Florida Keys and sanctuary. (See Section 4.4 for more information.)

Tides and wind-driven currents dominate the circulation and transport landward of the regional currents and within Florida Bay (Schomer and Drew 1982). Additionally, eddies that form along boundary currents paralleling the shoreline can cause periodic upwelling of cold, nutrient-rich waters (e.g., Tortugas and Pourtales gyres) (NOAA 1997; Szmant and Forrester 1996; Leichter et al. 2003).

Nearshore waters of the Florida Keys, defined as extending from the shoreline to the seaward edge of Hawk Channel, generally experience high variability in temperature, salinity, and other factors relative to the reef tract further offshore. Differences in circulation and the physical and chemical characteristics of water in the Florida Keys reflect exchange processes between Florida Bay and the Atlantic Ocean, and are influenced by the larger regional currents, smaller-scale wind-driven currents, and tidal exchange between Florida Bay and the Atlantic.

4.3.3.2 Water quality

Ensuring good water quality in the sanctuary is essential to maintaining the richness and diversity of its varied environments. Coral reefs depend on clear, clean, low-nutrient waters to thrive. Seagrass meadows also need a relatively low-nutrient environment and clear water. As noted in the hydrology section above, FKNMS is part of a complex hydrological system that includes the Everglades, Florida Bay, Biscayne Bay, and other adjacent and remote areas. Monitoring within and outside the sanctuary boundary has demonstrated that some conditions observed within the sanctuary are strongly influenced by conditions occurring outside the sanctuary. The Florida Current delivers water to the Florida Keys from the wider Caribbean and the Gulf of Mexico. Water from the southwest Florida Shelf, including riverine waters originating from coastal and agricultural communities, may flow through tidal passes in the Keys or be transported to the Atlantic Ocean south of the Keys. Surface water runoff from the Everglades, tidal exchange from Florida Bay and Biscayne Bay, and atmospheric deposition are additional sources of nutrients and other pollutants to waters surrounding the Florida Keys. Land-based inputs also affect sanctuary water quality, especially near shore where toxins and nutrients can enter the system from stormwater runoff and other sources. Toxins are mainly hydrocarbons, pesticides, herbicides, and heavy metals. Nutrients are derived primarily from fertilizers and wastewater and include nitrogen and phosphorous.

Water quality is generally good in the Florida Keys. However, nearshore water quality is affected by stormwater runoff and wastewater. Onsite septic systems still remain in portions of the Florida Keys, and older systems do not effectively remove nitrogen and phosphorus from effluent, which leads to eutrophication of nearshore waters. These are gradually being replaced by a county-wide sanitary sewer system. Similarly, stormwater runoff contributes to nearshore water quality degradation by flushing fertilizers, pesticides, contaminants, and pet waste into the water during rain events. Most of these pollutants are directly associated with coastal development. The four national wildlife refuges in the Florida Keys have an overall beneficial effect for nearshore water quality since they protect land from coastal development and the natural vegetation effectively traps nutrients and contaminants.

Petroleum (hydrocarbon) and other chemical discharges

Petroleum (oil, gasoline, and other hydrocarbons) and chemical spills in the sanctuary can potentially range from small, localized spills to large events that span hundreds of miles of coastline. Small-scale oils

spill from refueling activities and derelict vessels degrade water quality on a regular basis. Small boat engine operations constitute the most common type of spill and usually involves small discharges of fuel, oil, or hydraulic fluid that form a sheen on the water's surface. Other small spills tend to be associated with oil and fuel discharges due to small vessel (<65 feet or 20 meters) groundings or sinkings and plane crashes. Effects of small spills have not been adequately documented. The U.S. Coast Guard responds to reported oil spills in FKNMS.

Cruise ship discharges

In 2015, the Port of Key West received an average of one cruise ship per day (City of Key West 2015). While cruise ship visitation provides positive economic benefit to local businesses (see Section 4.6.7 for more information), concerns exist about the environmental impacts of these large vessels. Cruise ships provide many of the same services as land-based facilities and are capable of carrying hundreds to thousands of passengers and crew members. Cruise ships have the potential to generate pollution through discharges such as bilge water (water that collects in the lowest part of the ship's hull that may contain oil, grease, and other contaminants), blackwater (sewage), greywater (waste from showers, sinks, laundries, and kitchens), ballast water (water taken onboard or discharged from a vessel to maintain its stability), wash water from scrubbers (water used in exhaust gas cleaning systems), and solid waste (food waste and garbage). Ocean currents can transport these pollutants into and among sanctuary waters. Cruise ships also have the potential to cause benthic disturbances with each porting. Wakes generated by vessels and propeller turbulence resuspend sediment and transport it elsewhere. Under current regulations, discharge of greywater is permitted (see Chapter 3 for more discussion).

Water Quality Protection Program

The importance of water quality was recognized in the 1990 authorizing legislative language for FKNMS, which mandated creation of a WQPP to be administered by the Florida DEP and EPA. The purpose of the WQPP is to identify and implement priority corrective actions to address point and nonpoint sources of pollution in order to maintain the chemical, physical, and biological integrity of the sanctuary. The program is also charged with restoring and maintaining balanced indigenous populations of corals, shellfish, fish, and wildlife, and recreational activities in and on the water (FKNMSPA, USEPA 2013) (For more information on the WQPP see the institutional environment supporting material provided at www.floridakeys.noaa.gov/blueprint/.)

The WQPP supports long-term monitoring programs of water quality, coral reefs, and seagrass/benthic communities and selected special studies to address a variety of related topics. Research and monitoring projects are designed to quantify status and trends, answer resource management questions, and develop new scientific hypothesis for the sanctuary.

Since 1995, the Water Quality Monitoring Project of the WQPP has conducted regular monitoring at more than 100 fixed stations throughout the sanctuary. A variety of physical and chemical parameters are sampled, including salinity, water temperature, total phosphorus (TP), total nitrogen (TN), dissolved oxygen (DO), dissolved inorganic nitrogen (DIN), and total organic carbon (TOC).

Regional conditions outside FKNMS strongly influence sanctuary waters in this highly interconnected system of coastal and estuarine waters. Under certain conditions, external sources adjacent to the sanctuary (such as influences of Florida and Biscayne bays, the Loop and Florida currents, riverine waters and other land-based activities, and atmospheric inputs) can influence or even dominate water quality

conditions. Water quality monitoring shows that the highest chlorophyll-a values, indicative of phytoplankton blooms, are found in southwest shelf waters outside FKNMS. Nutrient concentrations fueling those blooms are found in waters outside of FKNMS on Florida's southwest shelf. Rivers on Florida's southwest coast carry nutrients from agriculture and other human activities in central and southwest Florida to the southwest shelf and Gulf of Mexico where they can fuel phytoplankton blooms. Currents can bring "bloomy" shelf waters into Florida Bay where they can flow into sanctuary waters on the ocean side of the Florida Keys. Nutrient sources within Florida Bay such as decaying seagrass and resuspended organic matter may exacerbate or trigger cyanobacterial blooms in the bay itself that can also flow into FKNMS. Widespread cyanobacterial blooms observed in central and northern Florida Bay in the early 1990s were fueled by an extensive seagrass die-off that began in the late 1980s. These blooms were known to flow into sanctuary waters through the channels between the Florida Keys before being dispersed. Similar blooms have occurred since that time and a widespread die-off of *Thalassia testudinum* was documented in 2015 in Florida Bay (Hall et al. 2016).

For more information about water quality status, impacts and efforts to assess and address these impacts, see:

- Water Quality Protection Program - <https://floridakeys.noaa.gov/wqpp/welcome.html>
- South Florida Ecosystem Restoration Task Force - <https://evergladesrestoration.gov/tf/>
- Water Quality Assessment Program - <https://floridadep.gov/dear/water-quality-assessment>

4.4 Pulley Ridge Unit

Part of the boundary expansion of Alternative 4 would include a distinct area in the southern portion of Pulley Ridge. The affected biological and physical environments of this area will be discussed together in this section.

Pulley Ridge is a limestone ridge that extends nearly 186 miles (300 km) along the southwestern Florida shelf in the eastern Gulf of Mexico. The southern terminus of Pulley Ridge supports a mesophotic coral ecosystem, which is the deepest known photosynthetic coral reef off the continental United States. The biodiversity consists of 95 species of macroalgae, 92 demosponges, 18 octocorals, 17 scleractinian corals, nine antipatharian corals, and 86 fishes. Twenty managed fishery species occur at Pulley Ridge, including red grouper, and since 2010 the lionfish population has dramatically increased. The dominant scleractinian corals are plate-like corals of the family Agariciidae (*Agaricia* spp. and *Helioseris cucullata*), *Montastraea cavernosa*, *Madracis* spp., and *Oculina diffusa*. The percent cover of benthic biota averaged 49.9 percent over all regions of Pulley Ridge, and macroalgae were dominant (46.5 percent cover). Scleractinian corals averaged 1.5 percent cover, and sponges had 1.2 percent cover.

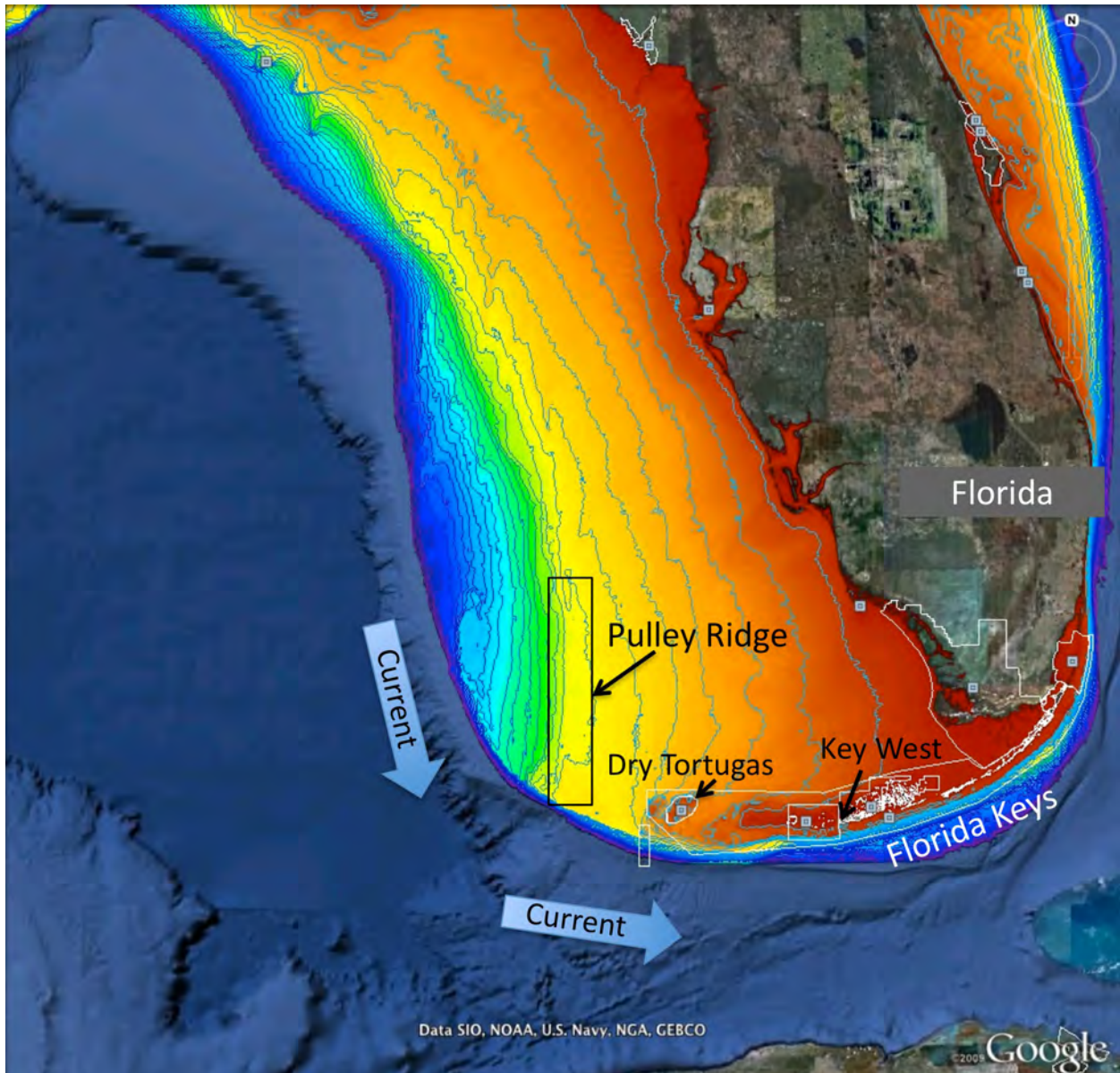


Figure 4.7. Pulley Ridge area in relation to South Florida and FKNMS. Image courtesy of Robert Cowen

4.4.1 Mesophotic Reef Habitats

Mesophotic coral ecosystems are characterized by the presence of light-dependent corals and associated communities typically found at depths ranging from 98 to 131 feet (30-40 m) and extending to over 328 feet (100 m) in the Gulf of Mexico. Once established, mesophotic reefs help create hardbottom habitat that become home to a diverse community of plants and animals, many of which are unique to these communities. The dominant communities providing structural habitat in the mesophotic zone can comprise coral, sponge, and algal species.

The southern portion of Pulley Ridge, at depths of 197 to 262 feet (60-80 m), supports the deepest known photosynthetic coral reef off the continental U.S. (Figure 4.7; Cross et al. 2005, Reed et al. 2015). In Pulley Ridge, these mesophotic corals live between 197 and 246 feet (60-75 m) in depth and are dominated by coralline algae and scleractinian corals. The dominant colonial scleractinian corals are the

plate-like colonies of the family Agariciidae (*Agaricia* spp. and *Helioseris cucullata*), *Montastraea cavernosa*, several species of *Madracis*, and *Oculina diffusa*. At these depths *M. cavernosa* also forms plate-like colonies, whereas in shallower water, they are commonly conical to mound shaped (Baker et al. 2016).

There are spatial differences within Pulley Ridge in the distribution of these taxa. The depth range for the agariciid corals is from 193 to 344 feet (59-105 m). The distribution of *M. cavernosa* ranges from 203 to 223 feet (62-68 m). Coral cover is greatest in the central basin, which is included in the current HAPC (Reed 2016, GMFMC 2018). Except for a few sporadic occurrences, *M. cavernosa* is only found on the Main Ridge. The agariciid plate corals are present in every region of Pulley Ridge but are most dominant on the main ridge and central basin. *Madracis brueggemanni* and *Madracis formosa* are the most abundant corals on the west ridge but are also common on the central basin and main ridge (Reed et al. 2019, <http://coastal.er.usgs.gov/pulley-ridge/index.html>).

Seismic maps indicate that drowned shoreline ridge complexes and pinnacles extend west of Pulley Ridge to depths of 328 to 492 feet (100-150 m), suggesting the potential for other mesophotic coral habitat in the region (Ballard and Uchupi 1970, Holmes 1981, Phillips et al. 1990). Recent research missions have documented an additional 124 square miles (321 km²) of mesophotic coral habitat adjacent to the portion of Pulley Ridge included in the HAPC (Reed et al. 2015).

In the past 10 years, the Pulley Ridge mesophotic coral ecosystem has experienced a substantial loss of scleractinian coral. The percent coral cover on the main ridge dropped from 12.8 percent in 2003 to 0.9 percent by 2012–2015, a 93 percent loss of coral. However, recent surveys show the majority of corals to be relatively healthy; only 1.21 percent of the colonies counted (38,368) showed signs consistent with “white syndromes” disease. The prevalence of disease on Pulley Ridge is relatively low compared to the Caribbean. The factors causing the decline of the coral communities at Pulley Ridge between 2003 and 2012 are unknown (Reed et al. 2019).

4.4.1.1 Sponge habitat and diversity

Within Pulley Ridge, hardbottom communities include a diverse assemblage of organisms and substrate. Recent surveys of Pulley Ridge have documented a high level of sponge biodiversity (relative to corals and other benthic invertebrates). Sponges are the most species-rich of all macrofauna, with 92 taxa identified to date (Reed et al. 2019). The most common taxa include *Agelas clathrodes*, *A. conifera*, *A. flabelliformis*, *Aiolochoia crassa*, *Amphimedon compressa*, *Aplysina lacunosa*, *Aplysina archeri*, *Auletta* sp., *Axinella corrugata*, *Callyspongia vaginalis*, *Erylus* sp., *Geodia gibberosa*, *G. neptuni*, *Ircinia campana*, *I. felix*, *I. strobilina*, *Niphates erecta*, *Oceanapia* sp., *Placospongia* sp., *Polymastia* sp., *Scopalina ruetzleri*, *Siphonodictyon coralliphagum*, *Spongisorites siliquaria*, *Verongula rigida*, *Xestospongia muta*, and numerous unidentified demosponges (Reed et al. 2017). Sponges are relatively common across Pulley Ridge but are most abundant on the west ridge.

4.4.1.2 Macroalgae habitats

Pulley Ridge includes a wide variety of fleshy macroalgae including *Halimeda tuna*, *Dictyota* sp., *Kallymenia* sp., and the endemic species *Anadyomene menziesii*, which covers many acres and can be as dense as tens of individuals per 10.7 square feet (<http://coastal.er.usgs.gov/pulley-ridge/index.html>).

Although taxonomic analyses are still in progress, a total of 60 species of Rhodophyta, 25 Chlorophyta, and 10 Phaeophyta have been identified. The most common red algae are crustose corallines, which are

predominant in the central basin and west ridge (i.e., the deeper regions of Pulley Ridge). Other common red algae are foliose species of *Halymenia* and *Kallymenia* and crustose species of *Peyssonnelia*. In contrast, green algae are predominant on the main ridge, which is the shallowest region. The leafy green alga *Anadyomene menziesii*, which is endemic to Pulley Ridge, is the most common species. The 55.8-foot (17 m) depth differential, from 193.6 feet (59 m) on top of the main ridge to 249.3 feet (76 m) on top of the west ridge, results in the observed spatial changes of the dominant species from green algae to red algae due to reduced light availability. Other common green algae include *Codium* spp., *Caulerpa racemosa*, *Caulerpa sertularioides*, *Halimeda* spp., *Valonia ventricosa*, and *Verdigellas peltata*. The brown algae are less common and dominated by *Dictyota* spp., *Lobophora variegata*, *Sargassum* sp., and *Padina* sp. (Reed et al. 2019).

4.4.2 Fishes

Fish species present at Pulley Ridge represent a mix of both shallow and deep-water species. A total of 86 fish taxa have been documented at Pulley Ridge (Harter et al. 2017, Reed et al. 2017). The most abundant fishes are school bass (*Schultzea beta*), striped grunt (*Haemulon striatum*), yellowtail reef fish (*Chromis enchrysurus*), purple reef fish (*Chromis scotti*), chalk bass (*Serranus tortugarum*), reef butterflyfish (*Chaetodon sedentarius*), roughtongue bass (*Pronotogrammus martinicensis*), cherubfish (*Centropyge argi*), cardinalfish (*Apogon* sp.), sunshinefish (*Chromis insolata*), and an unidentified *Chromis* sp. Several schooling species are abundant at night. These include schools of vermilion snapper (*Rhomboplites aurorubens*) and mackerel scad (*Decapterus macarellus*), as well as mixed schools of bonnetmouths (Inermiidae) and school bass (*Schultzea beta*). A total of 20 managed fishery species occur at Pulley Ridge. The most abundant are almaco jack (*Seriola rivoliana*), vermilion snapper (*Rhomboplites aurorubens*), and red grouper. Fish diversity was significantly higher on the main ridge compared to all other Pulley Ridge regions (Reed et al. 2019).

A significant feature in Pulley Ridge, particularly in the eastern portion, is a series of large 19 to 33 foot (6-10 m) wide pits in the sand and rubble bottom created by red grouper that provide shelter for numerous smaller reef fish. Red grouper burrow pits ranging from 16 feet to more than 49 feet (5->15 m) in diameter and three to six feet (1-2 m) deep are visible in multibeam maps that indicate there are nearly 155,000 burrows over the entire southern region of Pulley Ridge within the area surveyed (360 mi²/580 km²). Most active burrows have one adult male or female grouper of 1.6 feet (50 cm) or more total length. The burrows provide habitat and act as oases for many small reef fish. Most of the burrow pits surveyed in 2013 and 2014 also show a high prevalence of lionfish, ranging from several up to 60 lionfish per burrow (Reed et al. 2014). Additionally, in the central basin, mounds potentially created by sand tilefish (*Malacanthus plumieri*) are evident.

The new proposed Pulley Ridge HAPC regulations, per Amendment 9 to the Gulf of Mexico Coral FMP (GMFMC 2018), would extend most of the Pulley Ridge South fishing regulations to Pulley Ridge South Portion A (Figure 4.8), but would not include a restriction on bottom longlining in Pulley Ridge South. This proposed extension would allow a fishery that has historically used this area to continue to do so, but would include regulations to prevent use of other types of bottom-tending gear including bottom trawling, buoy gear, pots, or traps, and prohibit anchoring by fishing vessels. Hook and line fishing for grouper is allowed in the current and extended HAPC. This may explain why differences in the abundance of red grouper were not observed inside versus outside the HAPC (Harter et al. 2017). Overexploitation of red grouper could have negative effects on biodiversity at Pulley Ridge. Grouper pits inhabited by red

groupers were observed to have greater species diversity and fish abundances compared with the levels observed at pits not inhabited by a red grouper. Increased fish abundance and diversity are attributable to the pits with a red grouper being actively maintained, with the resident grouper of a pit using its fins and mouth to keep the pit scoured down to the rock ledges (Harter et al. 2017).

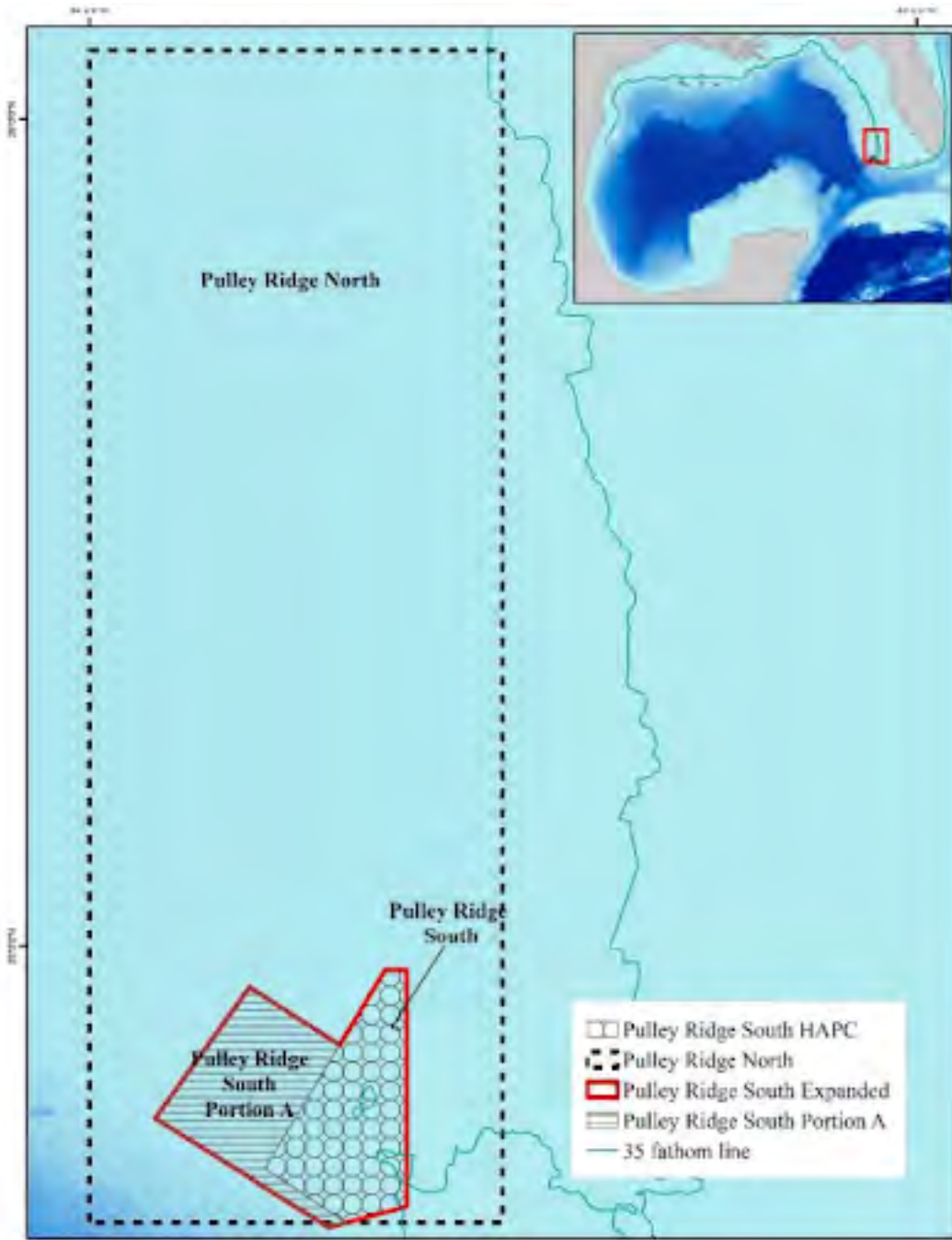


Figure 4.8. Pulley Ridge HAPC (2005) with GMFMC proposed expansion (2018) to include South Portion A. Image: GMFMC

4.5 Cultural and historical resources

Historical resources are defined by ONMS regulations as “any resource possessing historical, cultural, archaeological or paleontological significance, including sites, contextual information, structures, districts, and objects significantly associated with or representative of earlier people, cultures, maritime heritage, and human activities and events” (15 C.F.R. § 922.3). Historical resources are not only “historic,” or those pertaining to the most recent period of Florida history beginning with European exploration, but extend many thousands of years into the past to encompass Native American presence in the area. The ONMS regulations also state, “Historical resources include ‘submerged cultural resources,’ and also include ‘historical properties,’ as defined in the National Historic Preservation Act, as amended, and its implementing regulations, as amended” (15 C.F.R. § 922.33). ONMS regulations also define the term cultural resources similarly, but with less specificity. Thus, historical resources will be used henceforth in this document but is intended to encompass both historical and cultural resources.

The study area includes the existing sanctuary and proposed expansion areas encompassing a diverse assemblage of historical resources that reflect humanity’s interactions with the marine environment.

4.5.1 Management and oversight of historical resources

NOAA is the trustee for historical resources located within the sanctuary boundary. For historical resources located in state waters of the sanctuary, NOAA and the state of Florida serve as co-trustees. The sanctuary’s historical resources are unique, non-renewable remnants of the area’s maritime past and include hundreds of documented shipwreck sites and artifacts, cultural remains of indigenous peoples’ activities, Overseas Railroad remnants, and historic offshore structures. The Florida Keys’ unique geographical position adjacent to some of the busiest trade routes in the Western Hemisphere means that shipwrecks in the Keys contain a record of the last 500 years of the Atlantic region’s maritime activity. An estimated 2,000 shipwrecks are thought to have occurred in the Florida Keys since European exploration of the Western Hemisphere, with archival research identifying more than 1,000 reported shipwrecks to date. The FKNMS historical resource inventory contains information for more than 700 sites and objects including paleoenvironmental deposits, isolated cannons, anchors, shipwrecks, and historical aids to navigation. Currently, 14 shipwrecks and five lighthouses within the sanctuary are listed in the National Register of Historic Places.

Historical resources in the study area are described in several publications and additional information is available from a variety of sources. NOAA staff, contractors, and partners gathered this information for existing and future management efforts, to monitor conservation objectives, and as part of ongoing resource assessment, research, and education efforts. For a more detailed discussion on historical resources within the sanctuary, please refer to the following documents: “Description of the Affected Environment,” of the Florida Keys National Marine Sanctuary Environmental Impact Statement (NOAA 1997), Sanctuary Condition Report (NOAA 2011), NOAA Technical Memorandum NA87AA-H-CZ007, and An Inventory of Shipwrecks, Groundings, and Cultural Marine Resources within the Florida Keys National Marine Sanctuary (Halas, 1988). See Appendix C for a list of historical resources reported to occur in the sanctuary and the areas included in potential boundary expansion alternatives.

4.5.1.1 Oversight of historical resources

Current FKNMS regulations and the former Programmatic Agreement for the Management of Submerged Cultural Resources in the Florida Keys National Marine Sanctuary among NOAA, the Advisory Council on Historic Preservation, and the State of Florida have guided management decisions related to historical resources in the sanctuary. The most recent programmatic agreement expired March 24, 2016; however, NOAA continues to approach historical resource management in the same manner as was done under the programmatic agreement. NOAA reviews all proposed activities in both state and federal sanctuary waters with the State Historic Preservation Office (SHPO). When appropriate, the ACHP is also provided an opportunity to comment on sanctuary undertakings. Because these resources are non-renewable, decisions are made with a precautionary approach aiming to achieve a balance between resource protection and public use. NOAA is currently working with the Florida Department of State Division of Historical Resources (DHR) and the Advisory Council on Historic Preservation to develop a new programmatic agreement for purposes of meeting NOAA's responsibilities under Section 106 of the National Historic Preservation Act. (See Appendix C for the draft programmatic agreement for which NOAA is seeking public comments).

DHR is the primary agency with authority and responsibility for historical resources throughout Florida as set forth in Chapter 267 of the Florida Statutes under Title XVIII. DHR serves as a steward of these resources, engaging in regulatory activities, inventory, assessment, research, education, public interpretation, and grant assistance for historic preservation projects. DHR also maintains the Florida Master Site File (FMSF), which is the official inventory of historical resources throughout the state. The FMSF currently holds information on more than 200,000 historical resources, of which approximately 100 are within sanctuary waters. Under authority of the Federal Abandoned Shipwreck Act (P.L. 100-298: 43 U.S.C. 2101-2106), the state of Florida retains title to abandoned shipwrecks on state-owned submerged lands.

The Florida DHR issues permits for archaeological research on state lands pursuant to Florida Administrative Code Chapter 1A-32. Chapter 1A-32 sets forth the standards for individuals and institutions that may be issued an archaeological research permit and the criteria for evaluating research requests. The DHR also administers Chapter 1A-31 of Florida's Administrative Code directed at exploration and salvage of historic shipwreck sites. Chapter 1A-31 expressly prohibits the DHR from issuing permits for exploration and salvage of historic shipwrecks sites in FKNMS pursuant to the policies set forth in that chapter.

NOAA's primary role is to document, interpret, and protect historical resources for current and future generations. This is done through inventory, public education, and enforcement. NOAA also fosters non-consumptive recreational enjoyment and access to historical resources through programs such as the FKNMS Shipwreck Trail (NOAA 2011). Organizations and individuals may conduct research and educational activities directed at historical resources through a regulatory permitting program. Under its current structure, FKNMS historical resource permitting program provides three categories of permits: survey/inventory of historical resources, research/recovery of historical resources, and deaccession/transfer of historical resources. NOAA consults with the state of Florida via the DHR under Section 106 of the NHPA prior to taking any permit action related to historical resources in the sanctuary. Since implementation of the initial 1996 FKNMS management plan, 61 unique historical resource projects have been granted a survey/inventory or research/recovery of historical resources permit. No

deaccession/transfer permits have been applied for or issued. In the 1996 FKNMS final management plan and final environmental impact statement (Vol. 2, pg. 99), FKNMS recognized that Federal Admiralty Court rights of access to certain historic shipwrecks had been granted to a couple of organizations and individuals prior to congressional designation of the sanctuary. FKNMS continues to recognize such rights of access for those organizations and individuals that have continued to maintain the underlying admiralty rights. However, in accordance with section 304(c) of the NMSA and ONMS regulations at 15 C.F.R. § 922.47, these rights of access are subject to sanctuary regulation, and must be carried out in a manner consistent with other applicable laws such as the Abandoned Shipwreck Act (ASA), ASA guidelines, NHPA, NMSA, and FKNMSPA.

USFWS's role is to protect archaeological, cultural, and historical resources for future generations as examples of human interaction with the natural environment (USFWS 2009).

4.6 Socioeconomic resources and human uses

This section summarizes information on a variety of human uses and users and socioeconomic factors within the Florida Keys examined in detail in the supporting economic analysis for this DEIS (Leeworthy et al. 2019). Issue areas addressed include population; demographic profile; economic profile; tourism demand including for various recreational activities; commercial fishing; labor force, employment and income; land use and development; artificial habitats; marine transportation including vessel groundings, towing, and salvage operations; and offshore energy.

The study area for the socioeconomic resources and human uses includes the existing sanctuary area (Figure 4.9) and the areas in the Tortugas and Pulley Ridge that are included in potential boundary expansion alternatives.

Socioeconomic studies analyze the dependencies of local communities and economies on sanctuary resource uses and assess how people can adapt to or mitigate policy and management changes that are estimated to affect their levels of use.

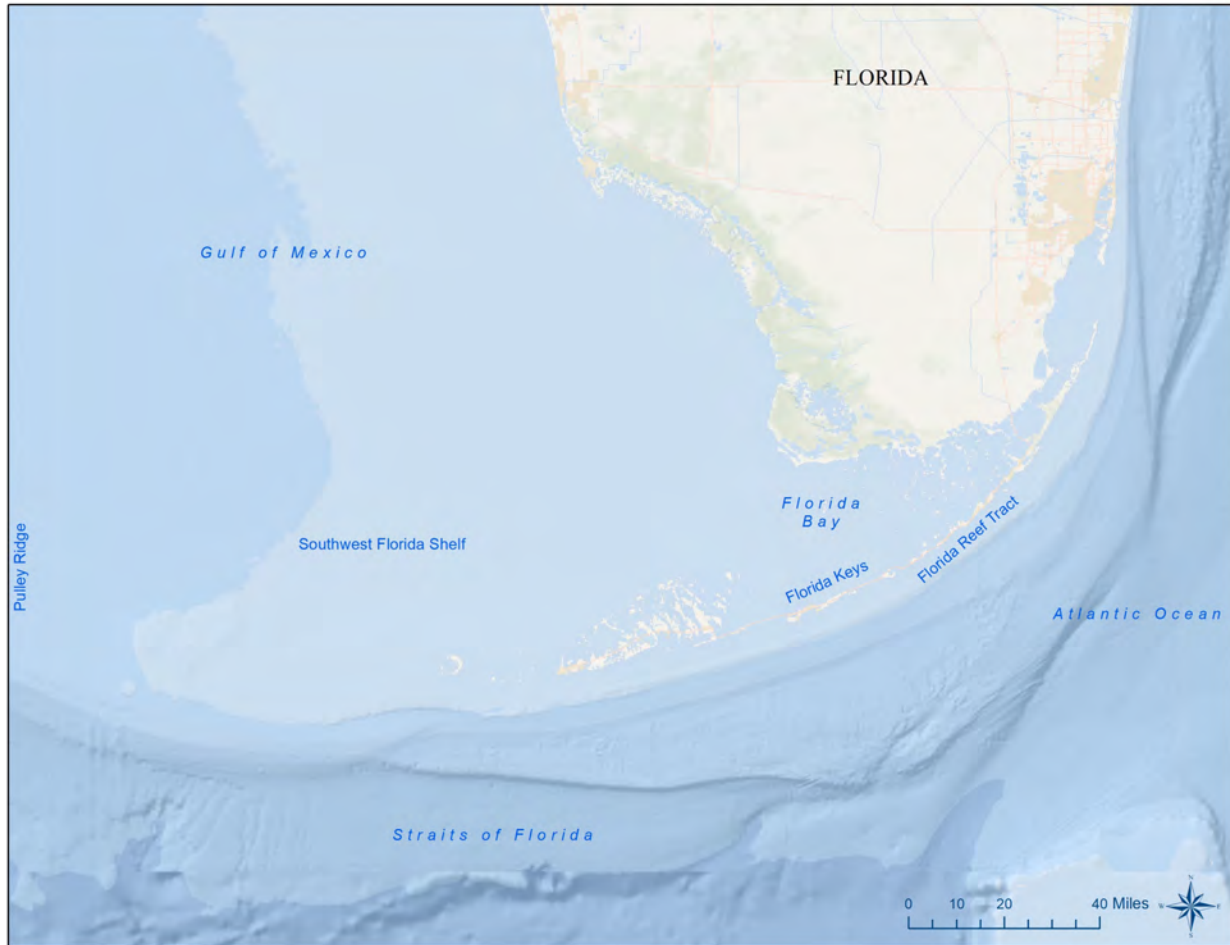


Figure 4.9. Map of Monroe County/Florida Keys, Florida Keys National Marine Sanctuary, and the Florida Keys National Wildlife Refuges Complex. Image: NOAA

Studies done on recreation tourism in the Florida Keys (English et al. 1996, Leeworthy and Ehler 2010) show that significant economic impacts take place in the three-county area of Broward, Miami-Dade, and Monroe County by visitors to the Florida Keys. The Florida Keys are all encompassed within Monroe County. A study on commercial fisheries showed that catch from FKNMS is landed in other counties on the west coast of Florida, primarily Collier and Lee counties (Leeworthy and Wiley 2000). However, the primary socioeconomic impacts of sanctuary resource use occur in Monroe County and the Florida Keys.

4.6.1 Population and key measurements on economic status of the Florida Keys

When assessing the conditions of sanctuary resources in ONMS condition reports, population is a key driver behind the pressures placed on sanctuary resources. Many in the population are also beneficiaries of the ecosystem services generated from sanctuary resources. Because tourism is so important to the economy of the Florida Keys, it is useful to analyze the effects of the functional population, the total amount of people (residents and visitors) in Monroe County on any given day.

4.6.1.1 Population

The Florida Keys (Monroe County, Florida) had a population of 73,090 in 2010, which was approximately 0.4 percent of the population of Florida. For 1995-96, the functional population of the Keys was estimated to be over 100,000 during an average day in the summer season (June through November) and over 130,000 per day during the winter season (December through May). For 2007-08, the functional population declined slightly for the summer season (to 102,000) and even more (to 116,000) for the winter season. Part of the decline was due to declines in the resident population and the 2007-08 recession that resulted in a decline in tourism. Visitor numbers have been increasing over the past several years, and by 2015, visitor estimates had again surpassed those of 1995-96. For the full year 2010, Monroe County had a functional population of 155,288 and was forecasted to increase to 157,400 by 2015 and 162,355 by 2030.

4.6.1.2 Population growth

The population of the Florida Keys has varied between 73,000 and 80,000 since 1990 and in 2010 was estimated to be 73,090.

Post-1990, Monroe County population growth has been significantly slowed by the Rate of Growth Ordinance (ROGO) restricting new housing development in the Florida Keys. The major concern motivating the creation of this ordinance was planning for hurricane evacuation. This restriction has led to a loss of housing affordable to service workers and thus a loss of lower income residents. This has also resulted in an increase in daily commuting for service workers who still work in the Florida Keys but can now only find housing in Miami-Dade County on the mainland. If the economy of the Florida Keys keeps growing and demand continues for lower wage workers, who must commute farther to reach those jobs, pollution from increased density in the current transportation system may increase negative effects on natural systems in the sanctuary.

4.6.1.3 Population density

Population density is an indicator of the extent of the pressures that the study area's population might have on sanctuary resources. Population density of Monroe County, at 74.3 people per square mile (28.6/km²), is moderately lower than the U.S. as a whole, and substantially lower than the rest of Florida. However, in the Florida Keys islands portion of Monroe County, population density is 591 per square mile (227.3/km²).

4.6.1.4 Per capita income

Per capita income is an indicator for the health and economic status of a community. In 2010, per capita income in Monroe County was \$56,415. In 2010, the per capita income in Monroe County was higher than the U.S. and Florida. Real per capita income (adjusted for inflation) grew faster in Monroe County from 1990 to 2005 than in the U.S. or Florida. From 2005 to 2010, it declined less than in Florida, but more than the U.S., which showed slight growth.

4.6.1.5 Unemployment rate

Another indicator of study area economic health is the unemployment rate. In 2010, the unemployment rate was 7.1 percent compared to 3.3 percent for 2017 in Monroe County. In 2010, Monroe County's unemployment was lower than both the U.S. and Florida. Historically, unemployment rates were also

lower in Monroe County than in the U.S. and Florida in 1990, 2000, 2005, and 2010. These trends have continued for years 2011 and 2012 and 2017.

4.6.2 Demographic profiles

For demographic profiles, gender, race/ethnicity, and age were chosen as the most important population characteristics. Race and ethnicity are treated separately in the United States Census. Racial categories include White, Black or African American, Asian, Alaskan Native or Native American, Native Hawaiian or Other Pacific Islander, and Multiple Races. In the census, the Hispanic category represents ethnicity, and is recorded separately from race. Hispanic includes the categories Hispanic, Latino, or of Spanish Origin.

4.6.2.1 Gender

Gender distribution has changed over time in Monroe County from 1990 to 2010. In 1990 and 2010, there were a greater proportion of males than females in Monroe County compared to U.S. and Florida. However, in 2000, Florida had a greater proportion of males than females than both Monroe County and the U.S.

4.6.2.2 Race/ethnicity

In 2010, the White population of Monroe County was higher than that of the U.S. and Florida. The Hispanic population was higher than the U.S., although lower than Florida. All other populations were lower than the U.S. and Florida. The White population in Monroe County has slowly declined from 1990 to 2010, while the Hispanic population has increased. The American Indian and Asian categories have not changed substantially from 1990 to 2010. Black populations had declined in 2000 but rose back by 2010.

4.6.2.3 Age

In 2010, the age distribution of Monroe County was older than the U.S. and Florida. Compared to the U.S. and Florida overall, there is a higher proportion of people aged 45 or older, and a lower proportion of children and young adults. The age distribution changed over time. In general, the proportion of the population ages 0 to 44 and ages 55 to 64 has decreased, and the populations aged 45 to 54 and 65 and older have increased since 1990. The key age group for workers in the tourism service industry (ages 20 to 44) shows significant declines from 1990 to 2010, which is correlated with affordable housing and the changes in number of commuters to Monroe County.

4.6.3 Economic profile

In the previous section, a few key indicators of the health of the economy using per capita income and unemployment rates were addressed. In this section, the total personal income generated within Monroe County (income by place of work) and what is received by residents of Monroe County (income by place of residence) is examined. The U.S. Department of Commerce Bureau of Economic Analysis maintains the national income accounts on both these bases.

People that live in a given area often receive income not derived by work in the area where they live. Many people commute to places of work outside the county where they live. People receive interest, dividends, and capital gains from investments. Retirees receive pensions and social security payments. The unemployed receive unemployment compensation. Income-by-place-of-work as a percent of income-by-place-of-residence is usually a good indicator of whether an area has a significant retirement

community or serves as a bedroom community for adjacent counties. Sources of income not tied to the status of work in the local economy can provide more resilience to the economy, making it less subject to vicissitudes of local work.

Regional economic theory and economic models of local economies classify industries into basic or export industries and local industries. Basic or export industries are the drivers of a local economy and bring new dollars into the community. Local industries are a response to these basic or export industries in meeting local demands for goods and services: they are what are included in the ripple or multiplier impacts from changes in the basic or export industries.

In Monroe County, there are six basic or export industries: tourism, retirement, bedroom community, commercial fishing, the military, and manufacturing. Tourism and retirement are the leading industries. Both bring new dollars into the community that is unassociated with work in Monroe County. Tourists bring new dollars into the community and spend it on a wide variety of goods and services, generating local income and employment. Retirees receive pensions, social security, and returns on investments and spend this money, locally generating income and employment. The U.S. Navy and U.S. Coast Guard have a significant presence in the Florida Keys, particularly Key West, which brings new dollars into the local economy that generates local income and employment. A description of Department of Defense/U.S. Navy activities in the area is found in Appendix F. The Navy continues to update their activities based on the needs of the Department of Defense. NOAA is working with the Navy to determine which activities have been traditionally conducted in the Florida Keys and sanctuary since FKNMS designation. Any new activities not considered in the original 1997 FKNMS final EIS or activities whose nature and scope have been modified would trigger NMSA section 304(d) consultation.

Most commercial fishing catch is exported outside Monroe County, so demand originates outside the county and again brings new dollars into the community, which generates local income and employment. Monroe County (Florida Keys) also serves as a bedroom community for people who work in counties to the north. They bring those dollars earned from work outside the county and spend it locally on goods and services, thus generating income and employment locally. Manufacturing is small in Monroe County and is focused on artistic goods and services such as jewelry, art, literature, and other gifts and souvenirs. Most of these goods and services are sold to those who reside outside Monroe County (Florida Keys) and are thus a source of new dollars flowing into the area supporting local income and jobs.

All of these export industries, except the military, are dependent upon the quality of the area's natural resources attracting tourists, retirees, and sustaining production of marketable fish.

4.6.3.1 Tourism demand

A good indicator for tourism is the number of visitors. The Monroe County Tourist Development Council (TDC) has estimated the total annual number of person-trips for 2008-2009 and 2013-2014 (Bennet 2015). A person-trip is a trip made by one person, and may consist of multiple person-days. (See the supporting analysis for the Restoration Blueprint available at www.floridakeys.noaa.gov/restration for more details on methodology.)

These annual estimates have shown that in 2007-08, there were 3.27 million person-trips made to the Florida Keys, up from 3.06 million in 1995-96. Visitation dropped after the 2008 recession but had grown back to 2.98 million by 2013-2014, with 27 percent coming by cruise ship. This percentage has not changed significantly more recently. However, the increase in visits via cruise ship affects the intensity of

uses in different areas. Cruise ship visitors may mostly affect day-use infrastructure and natural resources of the immediate Key West area and the cruise port, rather than distributing their effects more evenly throughout the Florida Keys, as would visitors who come by land transport and who may stay over multiple days.

In 2013, domestic leisure/recreation visitors spent 15.98 million person-days in the Florida Keys. This increased to 16.22 million in 2014 and to 16.52 million in 2015, with international visitors making up 20 percent of the 20.57 million total in 2015 at 4.05 million estimated person-days. From 1995-96 to 2015, this is an increase in visitation of 54.7 percent.

The share of the Monroe County economy accounted for by recreating visitors accounted for 59.9 percent of output/sales in 2007-2008. For income, recreating visitors accounted for 43.8 percent in 2007-08, while for employment recreating visitors accounted for 55.3 percent of all full-time and part-time jobs in 2007-08.

4.6.3.2 Recreation activities

In total, visitors and residents spent 25.55 million person-days of recreation in Monroe County in 2008. The top four activities were beach use, scuba diving and snorkeling, wildlife viewing, and fishing. Visitors accounted for over 91 percent of the beach use, 83.3 percent of scuba diving and snorkeling trips, 81.7 percent of the wildlife viewing, and 63.4 percent of the fishing. Visitors accounted for over 93 percent of the charter boat fishing. Residents accounted for over 56 percent of the flats/backcountry fishing, thus residents of the Florida Keys accounted for the majority of flats/backcountry fishing (Table 4.1).

Table 4.1. Visitor and resident recreation use by activity 2008 (thousands of person-days)

Type of activity	Visitors	Residents	Total	Percent visitor	Percent of total
Beach use	3,162.9	305.1	3,468.0	91.20	29.03
Recreational fishing	1,312.1	756.5	2,068.6	63.43	17.31
Charter boat Fishing	222.0	16.2	238.2	93.20	1.99
Flats/backcountry fishing	149.9	189.1	339.0	44.22	2.84
Scuba diving & snorkeling	2,306.2	463.5	2,769.7	83.27	23.18
Recreational boating	700.4	245.9	946.3	74.01	7.92
Personal watercraft	264.6	53.6	318.2	83.16	2.66
Windsurfing, sailboarding	17.8	3.9	21.7	82.03	0.18
Wildlife viewing	2,185.5	488.3	2,673.8	81.74	22.38
From a boat	661.0	203.8	864.8	76.43	7.24
From land	1,524.5	284.5	1,809.0	84.27	15.14
Total¹	9,684.9	2,263.2	11,948.1	81.06	100.00

1. Totals include double-counting across activities since people can do more than one activity per day.

Note: A person-day is any part of a day or a whole day.

Sources: Leeworthy, Loomis, and Paterson 2010; Leeworthy and Morris 2010.

4.6.3.3 Visitation at Florida Keys National Wildlife Refuges

The three Lower Keys National Wildlife Refuges offer visitation throughout the year, including environmental education and interpretation, wildlife observation and photography (all Lower Keys refuges), hiking/jogging/walking and bicycling (National Key Deer Refuge), fishing (all Lower Keys refuges), beach use (National Key Deer Refuge and Key West National Wildlife Refuge), and horseback riding (National Key Deer Refuge). While Crocodile Lake National Wildlife Reservation is closed to visitation, the refuge does offer public access through organized events and volunteer activities. National Key Deer Refuge manages over eight miles of designated interpretive and hiking trails and approximately 20 additional miles of fire roads that are open to public access.

Annual visitation is estimated at: National Key Deer Refuge - 190,000, Crocodile Lake National Wildlife Refuge - 3,000, Great White Heron National Wildlife Refuge - 140,000, and Key West National Wildlife Refuge - 340,000. The estimated total annual visitation to the Florida Keys National Wildlife Refuges is 673,000.

4.6.3.4 Visitation at national and state parks

Florida Keys National Marine Sanctuary borders or surrounds parts of three national parks. Part of Everglades National Park is located in Monroe County outside and northwest of the Florida Keys. Biscayne National Park borders Monroe County and the sanctuary on the northeast, and Dry Tortugas National Park is surrounded by the sanctuary in the west.

Everglades National Park is a popular national park drawing over 1 million visitors a year (the six-year average through 2017 was 1.1 million). Only a portion of Everglades National Park visitation enters FKNMS via boat ramps at the Flamingo area, with most of the use for flats/backcountry fishing. Using the six-year averages, Everglades National Park accounted for 94 percent of the national park visitation and almost 22 percent of the total state and national park visitation in Monroe County.

Biscayne National Park borders the sanctuary on the northeast and also provides access to FKNMS through Card Sound or over the portion of the reef tract within the park. Biscayne National Park averages just under 500,000 visitors per year. Visitation by boat through Biscayne National Park mostly comes from boat ramps and marinas in Miami-Dade County.

Dry Tortugas National Park is remote, situated around 70 miles from Key West, and is accessed only by boat or seaplane. The park averages 63,000 visitors per year. In Dry Tortugas National Park's most recent management plan, the park has increased access restrictions. Very few people access the park via private household boats. Almost all access is provided to Fort Jefferson via large commercial boats that drop people off at Fort Jefferson for the day or by seaplane. Once at Fort Jefferson, there are no operations that can disperse people throughout the park by boat. All operators that take people to Dry Tortugas National Park are required to have a permit. Dry Tortugas National Park accounted for seven percent of all national park visitation and a little over one percent of the total state and national park visitation in Monroe County using the six-year averages.

Monroe County has 11 state parks, including the Florida Keys Overseas Heritage Trail, which runs alongside U.S. Highway 1. State park visitation has been highly variable over the six-year period 2010-2015, ranging from a low of 2.1 million for all state parks in 2010 to a high of almost 4.6 million in 2013.

The Florida Keys Overseas Heritage Trail opened in 2011 and is a 90-mile-long string of pathways, bridges, and greenspaces abutting U.S. Highway 1. The trail provides pedestrian and bicycle access to the scenic highway. It has the highest visitation of any state park in the Florida Keys. In 2015, it accounted for 38.5 percent of all state park visitation in the Florida Keys.

John Pennekamp Coral Reef State Park, created in 1960, is the next most visited state park in the Florida Keys. From 2010-2015, the park accounted for 22 percent of the state park visitation and 17 percent of all state and national park visitation. Bahia Honda was ranked third in state park visitation over the six-year period accounting for 19 percent of all state park visitation and almost 15 percent of all state and national park visitation.

The six-year average for all state parks was 3.68 million, while for the two national parks it was 1.1 million. For the total across all state and national parks, the six-year average for visitation was 4.78 million. State parks accounted for almost 77 percent of all state and national park visitation using the six-year average.

4.6.3.5 Recreation-tourism supply

Demand for recreation-tourism can be constrained directly by the supply of facilities that provide access or indirectly by factors such as the hurricane evacuation requirement and the capacity of the roads to facilitate evacuation. To some extent, the number of housing units that can be permitted each year under the Monroe County Rate of Growth Ordinance is constrained by the hurricane evacuation requirement and road capacity, and with housing constrained, the number of visitors is constrained.

4.6.3.6 Commercial fishing

Like recreation-tourism, commercial fishing is a direct use of natural resources in FKNMS. The FWC-FWRI keeps information on Florida's commercial fisheries. This analysis shows the FWRI statistical areas that best overlay the boundaries of FKNMS to estimate the amount of commercial catch and marine life collection that comes from FKNMS.

FWRI reports where the catch from each statistical area is landed by county. Not all the catch from the statistical areas that define FKNMS is landed in Monroe County. In 2013, the proportion of catch from FKNMS landed in Monroe County ranged from a low of 10.5 percent for food shrimp and a high of 99.87 percent for stone crab claws.

Trends in revenue from catch

From 2000 to 2012, total revenue received by fishermen for their catch has been declining throughout the state of Florida. Catch from FKNMS and the portion of that catch landed in Monroe County have also declined in value (Figure 4.10). Revenues from catch in FKNMS and landings of that catch in Monroe County declined more than in the state as a whole (-26.2 percent for the state of Florida, -30.4 percent for FKNMS, and -31.3 percent for Monroe County). However, for the 2009 to 2012 time period, revenues from catch increased for Florida catch, increasing 44.7 percent for FKNMS and 59.5 percent for Monroe County.

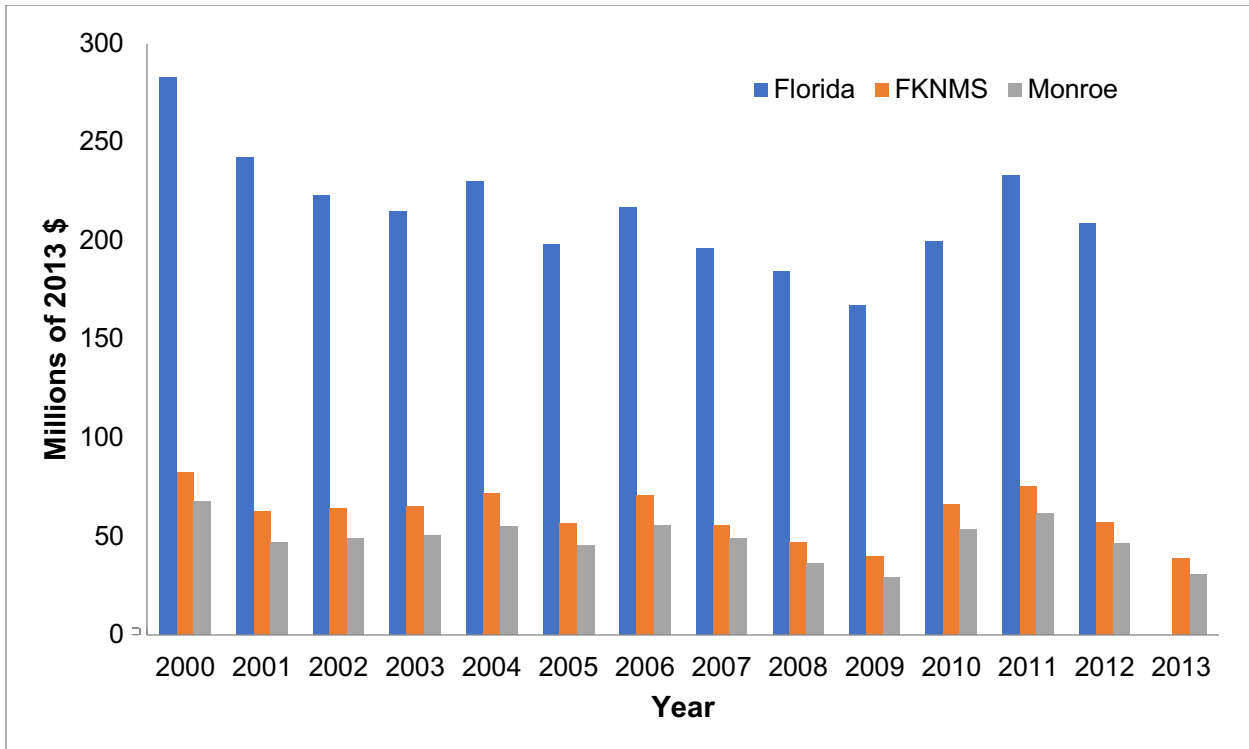


Figure 4.10. Commercial fishing harvest revenues in Florida, FKNMS, and Monroe County from 2000 to 2013. Image: NOAA

Plants, live rock and live sand are no longer harvested from the statistical areas that make up FKNMS. The current levels of marine life collection in FKNMS are not significant, ranging from a high of \$28,000 in 2007 to a low of \$400 in 2012.

4.6.3.7 Baselines for assessing impacts of regulations

Estimates of baseline conditions are needed to assess the potential impacts of regulations. For fisheries, estimates of future potential impacts should be judged based on sustainable yields. In most cases, the NMFS Southeast Regional Office recommends using a five-year average as the baseline for assessing potential impacts of regulations (Stephen Holiman pers. comm. 2014). The MSA requires the use of annual catch limits and accountability measures to prevent stocks from experiencing overfishing and to take action if catch levels are too high. Table 4.2 reports the 2009-2013 average catch measured in pounds and revenue by species/species groups for commercial fisheries. Table 4.3 reports the 2009-2013 averages for fish and invertebrates in marine life collection. Analyses of the impacts of regulations that would potentially affect fisheries use the 2009-2013 baselines unless the annual catch limits are significantly different.

In Monroe County, there were 1,312 commercial fishing licenses in 2013, or 10.5 percent of the state total. From 2000 to 2013, the number of license holders in Florida declined from 14,163 to 12,492 (by 11.8 percent), while those in Monroe County declined from 2,463 to 1,312 (by 46.7 percent) due to consolidation brought on by fishery management actions.

Table 4.2. Commercial fishing landings from FKNMS: 2009-2013 average, by species/species groups

Species/species group	Pounds	% of pounds	Revenue (2014 \$) ¹	% of revenue	% Landed in Monroe
All finfish	4,488,641	30.70	10,217,527	18.43	86.40
Reef fish	2,600,184	17.78	7,483,277	13.50	88.17
Grouper/snapper	2,205,794	15.09	6,985,906	12.60	87.59
Other reef fish	394,389	2.70	497,371	0.90	96.86
Sharks	242,234	1.66	289,099	0.52	96.78
Mackerel	1,003,521	6.86	1,229,161	2.22	98.03
King mackerel	888,266	6.07	1,136,966	2.05	98.06
Tuna, mahimahi, wahoo, and swordfish	262,423	1.79	1,024,553	1.85	68.48
Other finfish	380,279	2.60	191,437	0.35	90.97
All invertebrates	10,133,518	69.30	45,229,906	81.57	77.13
All lobster	3,695,255	25.27	22,661,328	40.87	99.45
Spiny lobster	3,694,690	25.27	22,657,303	40.86	99.49
Food shrimp	5,156,489	35.26	11,442,660	20.64	10.51
Bait shrimp	19,607	0.13	1,680	0.003	100
All crab	1,070,527	7.32	10,842,117	19.55	99.67
Stone crab	1,013,608	6.93	10,707,986	19.31	99.87
Sponges	191,263	1.31	281,472	0.51	70.62
Other invertebrates	377	0.003	650	0.001	69.64
Total all species/species groups	14,622,160	100.00	55,447,434	100.00	79.78

1. Dollars converted to February 2014 dollars using the Consumer Price Index for All Urban Consumers, U.S. City Average, All Items.

Sources: Florida Fish and Wildlife Conservation Commission; Fish and Wildlife Research Institute; and U.S. Department of Labor, Bureau of Labor Statistics, Consumer Price Index.

Table 4.3. Marine life collection in FKNMS: 2009-2013 average, by species group

Species group	Pounds	% of pounds	Revenue (2014 \$) ¹	% of revenue
Fish	589	3.23	2,921	43.36
Invertebrates	17,672	96.77	3,815	56.64
Plants	0	0.00	0	0.00
Live rock	0	0.00	0	0.00
All marine life	18,261	100.00	6,736	100.00

1. Dollars converted to February 2014 dollars using the Consumer Price Index for All Urban Consumers, U.S. City Average, All Items.

Sources: Florida Fish and Wildlife Conservation Commission; Fish and Wildlife Research Institute; and U.S. Department of Labor, Bureau of Labor

The 2009-2013 average of the total landings from FKNMS was about \$55.5 million, of which approximately \$44.3 million or 80 percent was landed in Monroe County. Other significant counties of landing include Lee and Hillsborough counties, primarily with food shrimp landings (60.54 percent in

Lee County). The commercial fishing catch in FKNMS is dominated by invertebrates (lobster, shrimp, and crab), which for the 2009-2013 average accounted for 81.57 percent of the revenue received by fishermen, while finfish accounted for 18.43 percent. Spiny lobster accounted for 40.86 percent, food shrimp 20.64 percent, and stone crabs 19.31 percent. For finfish, reef fish accounted for 13.5 percent of all revenues received by fishermen. The grouper/snapper species group of reef fish accounted for 12.6 percent. King mackerel accounted for 2.05 percent, while the species group of tuna, mahimahi, wahoo, and swordfish accounted for 1.85 percent of all revenues.

4.6.3.8 Economic impacts of FKNMS catch on the Monroe County economy

Historically, the Monroe County commercial fishery has been primarily an export industry, with most of the catch sold outside (exported) the county (Shivlani 2014). Using the 2009-2013 average harvest revenues received by fishermen, we estimate that the economic impact on Monroe County from catch made in FKNMS is more than \$80.9 million in total output/sales, about \$50.2 million in income, and 1,265 full- and part-time jobs. These totals include the ripple or multiplier impacts in Monroe County.

4.6.4 Labor force, employment, and income

4.6.4.1 Labor force

In 2015, there were 46,046 people in the Monroe County labor force, which is approximately 0.5 percent of the entire Florida labor force. From 2010 to 2015, the labor force slightly declined by -0.6 percent compared to growth of 4.9 percent for all of Florida. This may be a result of the Rate of Growth Ordinance discussed earlier. The size of the labor force is closely tied to the availability of affordable housing and was dramatically reduced again after many homes were lost to Hurricane Irma in 2017.

4.6.4.2 Personal income

In 2015, income by place of work as a percent of income by place of residence was 44.9 percent in Monroe County, lower than that of Florida as a whole, meaning that more people generated their income from sources outside the county, such as retirement benefits, investments, or by commuting to work locations outside the county, than from work performed within the county. The amount of income earned in Monroe County by people who live outside the county is subtracted from this measurement, as they take their incomes home to areas outside the Monroe County. Income by place of residence was higher in Monroe County than in Florida in 1990 but has been lower than Florida since 2000. From 1990 to 2000, the percentage increased in Monroe and Florida. Since 2000, the percent of income by place of work has decreased in Monroe and Florida.

4.6.4.3 Employment

In 2015, 62,780 people were employed in Monroe County. Total employment in Monroe County grew slowly from 43,697 in 1990 to 54,926 in 2010. However, both the state and county experienced an increase in total employment growth for the period 2010 to 2015 as they recovered from the economic recession.

4.6.4.4 Proprietor's income and employment

The Regulatory Flexibility Act requires NOAA to analyze the potential impacts of sanctuary management strategies and regulations on small entities, primarily small businesses. Almost all businesses related to either the commercial fishing industry or the recreation-tourist industries are small businesses. The extent

of proprietor's income and employment are good indicators of the extent of small businesses in the study area.

In 2015, there were 18,673 proprietors employed in Monroe County, making up 29.7 percent of total employment in Monroe County. The proprietors made a little over \$306 million in that year, which was 11.7 percent of all income earned by place of work in Monroe County. Monroe County had lower percentage of its income from proprietors than Florida, but a higher percentage of employment, from 1990 to 2015.

4.6.4.5 Personal income by industry

In 2015, Monroe County had a noticeably higher proportion of personal income from accommodation and food services and government and government enterprises sectors than in Florida overall, with lower proportion from the health care and social assistance, professional, scientific, and technical services, finance and insurance, wholesale trade, and manufacturing sectors.

4.6.4.6 Employment by industry

In 2015, Monroe County had a higher proportion of its employment created by accommodation and food services, real estate and rental and leasing, and forestry, fishing, and related activities (fishing in Monroe County) sectors compared to Florida, with a lower proportion from the health care and social assistance, administrative and waste management services, finance and insurance, and manufacturing sectors.

4.6.5 Land use and development

Current and future uses of land and development are based on the Monroe County 2030 Comprehensive Plan's technical document (Monroe County 2011).

Monroe County residential development is controlled by the Rate of Growth Ordinance, which limits the amount of residential development based upon the ability to safely evacuate the Keys within 24 hours. Under ROGO, the state only allocates 197 housing units per year to the county for building permit issuance.

Monroe County also adopted a Non-Residential Rate of Growth Ordinance in 2001 to “ensure a reasonable balance between the amount of future non-residential (primarily commercial) development and the needs of a slower growing residential population...” (Monroe County 2011). The Non-Residential Rate of Growth Ordinance attempts to maintain a ratio of approximately 239 square feet (22.2 m²) of nonresidential floor area for each new residential permit issued through the Residential Rate of Growth Ordinance. “More than 75 percent of land in the unincorporated Keys is set aside for conservation purposes. Of the developed land uses, Residential is the largest land use category, representing approximately 6.8 percent of the land uses in the County, followed by Military at 5.5 percent, Utilities and Rights-of-Way at 4.4 percent, Vacant at 3.2 percent, Recreation at 1.8 percent and Commercial at 1.2 percent” (Monroe County 2011).

4.6.5.1 Functional population projections

Population projections for the functional population are also a driver for estimating future land uses. The functional population includes the number of permanent residents plus the number of seasonal residents in the Florida Keys on a given day. This number varies by season because of seasonal patterns of visitation. In addition, seasonal visitors are a classification used by the Monroe County Planning Department that

ties population with demand for housing as well as for evacuation. Seasonal residents include visitors to Monroe County (including day visitors) and residents that are renting. The functional population projections are constrained by all the above noted constraints on growth and development.

The functional population for Monroe County (unincorporated and incorporated areas) is important for planning roads, water supply, sewage treatment, and other infrastructure needs. One of the most important uses is for hurricane evacuation, which is a key element constraining growth in Monroe County. Most of the land that can be developed in Monroe County exists in the unincorporated areas, so the population projections are important in assessing the potential for growth in the development of those lands.

From 2015 to 2030, the functional population for all of Monroe County is projected to increase 3.1 percent, adding an average of 330 people per year. In the unincorporated areas of the county, the functional population is projected to grow 3.05 percent, adding on average 146 people per year (Leeworthy et al. 2010).

4.6.6 Artificial reefs

Since FKNMS regulations became effective in 1997, four large artificial reef projects have been permitted for deployment in sanctuary waters. There are another 71 artificial habitats in FKNMS, including 30 ships. Florida has a very active artificial reef program and maintains an updated list of all artificial habitats in the state. See Figure 4.11 for a map showing the distribution of artificial habitats in the sanctuary.

Monitoring of permitted artificial reefs before and after sinking has been minimal, and is largely limited to monitoring fish populations. REEF conducted roving diver surveys to document fish species and relative abundance at *Spiegel Grove* and nearby natural reefs before and after sinking, and found that species composition five years after deployment was similar to that of nearby deep reefs and less similar to that of the shallow reference reefs (REEF 2007). Similar monitoring occurred on *Vandenberg* for approximately four years total to examine reef fish prior to and post-sinking, and found this artificial reef was consistently one of the least species-rich sites throughout the monitoring project (REEF 2012). Lacking is monitoring on fish biomass, size structure, or fish tracking, and no monitoring programs were undertaken to examine invertebrate populations resulting from the artificial reef projects.

A 2001 study of the four South Florida counties conducted through resident and visitor surveys documented that reefs in Monroe County generated \$490 million in reef-related expenditures in a one-year period, with approximately 74 percent of that revenue derived from natural reefs and 26 percent derived from artificial reefs (Johns et al. 2001). The study also examined the value that users place on natural and artificial reefs, and estimated that in Monroe County, “visitor and resident reef users are willing to pay \$9 million to protect the artificial reefs and \$55 million to protect the natural reefs” (Johns et al. 2001).

Multiple studies, including REEF fish monitoring, have documented expansion of the invasive orange cup coral, *Tubastraea sp.*, to artificial reefs in the Middle and Lower Keys. Previously, it had only been documented on Upper Keys artificial structures such as the Aquarius underwater habitat and *Spiegel Grove*. This species is rarely found on natural reefs in Florida, but it has colonized rocky substrates and reef habitats in the Gulf of Mexico, Caribbean, Bahamas, and Brazil (Cairns 2000). Other non-native

invertebrates, including oysters, gastropods, and worm snails, have been documented on FKNMS artificial reefs (Mikkelsen and Bieler 2007, Bieler et al. 2017). See Section 4.2 for more information.

Longevity and structural integrity of artificial reefs in FKNMS is a concern, especially as failures could impact nearby natural species and habitats of the sanctuary. By nature, artificial reefs are expected to settle and degrade over time, but unanticipated movement can occur, notably during hurricanes, which are prone to making landfall in the South Atlantic and Gulf of Mexico. Post-Hurricane Irma (September 2017), only two of the four large artificial reefs permitted by FKNMS have been surveyed for stability, *Spiegel Grove* and *Vandenberg*. A report on the former notes the vessel is in the same location and orientation as pre-Irma; however sediment levels at the artificial reef have shifted, resulting in the covering and uncovering of anchor cables and chains.

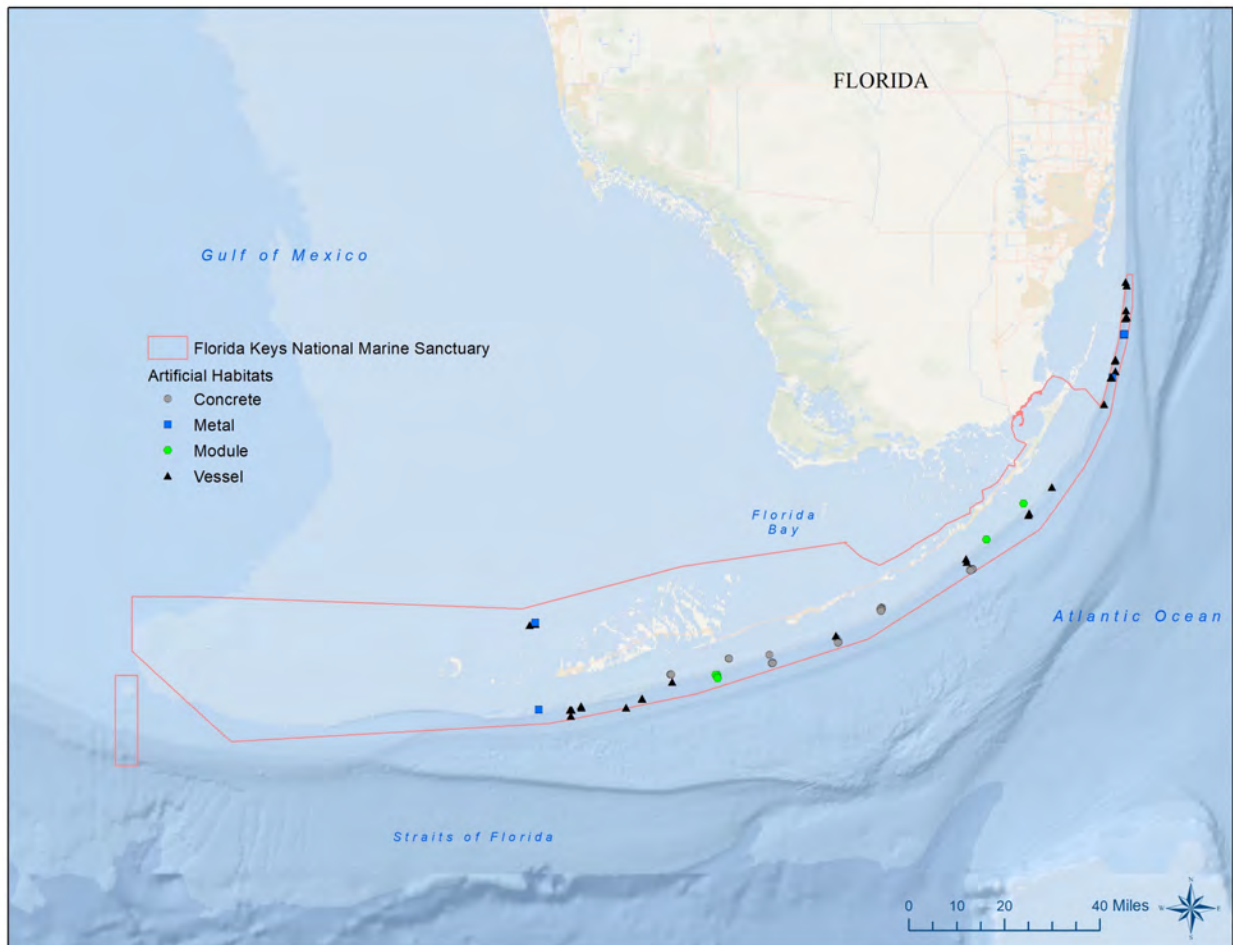


Figure 4.11. Map of existing intentionally-deployed artificial habitat in FKNMS. Black dots are vessels, grey dots are repurposed concrete structures, blue dots are metal, and green dots are reef ball modules.

4.6.7 Marine transportation

Ocean-based commerce and industries are important to the maritime history, modern economy, and social character of the Florida Keys region. The Straits of Florida have historically been the access route for all vessels entering the Gulf of Mexico from the north and east and, consequently, the area is one of the most heavily trafficked in the world. It is estimated that 40 percent of the world’s commerce passes within 1.5

days sailing time of Key West. In addition, oil tankers transit the coast daily, including very large and ultra-large crude carriers.

There are seven major ports that receive vessels that may transit through the Straits of Florida and the Gulf of Mexico and therefore in the proximity of the Florida Keys and FKNMS. These ports are Port Everglades, Port of Miami, Key West, Tampa Bay, New Orleans, Mobile, and Houston/Galveston.

Using the Bureau of Ocean Energy Management’s (BOEM) Marine Cadastre, vessel traffic density was analyzed offshore of the Florida Keys in both the Gulf of Mexico and Straits of Florida, including waters of the study area. Vessel traffic density analysis reveals that in 2017 roughly 5,000 cargo ships, tankers, and passenger vessels greater than or equal to 100 meters (328 feet) passed by the sanctuary, of which more than 60 percent were cargo vessels and 36 percent were tankers. Passenger ships accounted for approximately two percent of the total (Figure 4.12).

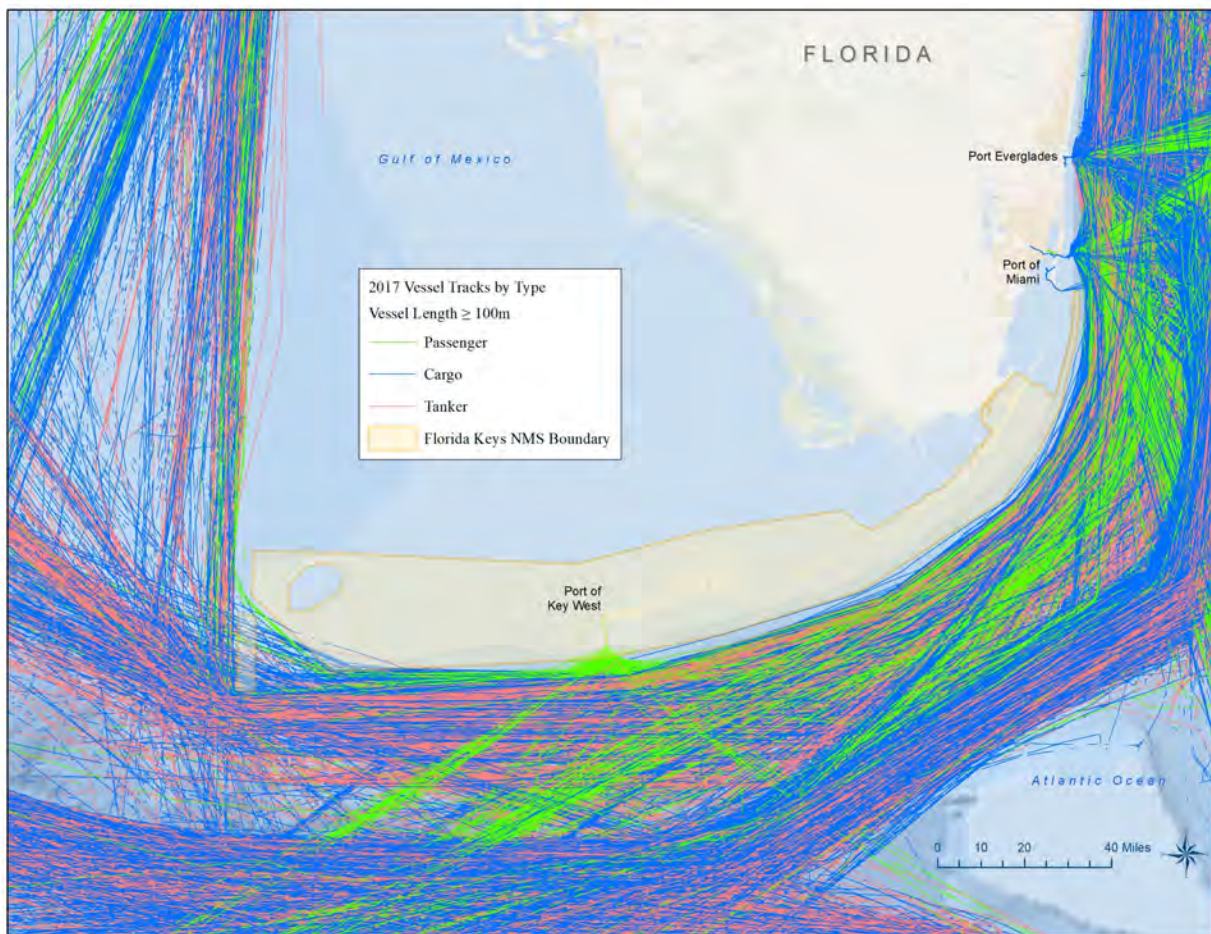


Figure 4.12. Vessel traffic by type, 2017. Source: BOEM Marine Cadastre

Port Everglades and the Port of Miami are the major cruise ship access ports in Florida. Both have experienced steady gains in cruise ship traffic due in part to recent expansions. (Miami-Dade County 2018, 2019; Broward County 2019). Many of the vessels that originate in Port Everglades or the Port of Miami include the Port of Key West on their itinerary. The Port of Key West is a major cruise ship

destination with an average 395 port calls per year and 848,957 passengers annually from 2001 to 2016 (City of Key West 2015).

Large commercial vessels are of particular concern because of the potential for oil spills, grounding, anchor and chain impacts, and loss of cargo overboard. These vessels often travel close to shore and can carry upwards of 1 million gallons of bunker fuel, a heavy, viscous fuel similar to crude oil that is used to power the ships. A large spill could have a major impact on foraging birds, marine mammals, and fishes, as well as important habitats (see Sections 4.2.1 and 4.2.2 for descriptions of habitats and wildlife), and therefore could have deleterious consequences for tourism and the coastal economy.

In addition to the threat of oil spills, vessel grounding is also a known threat. Although the vast majority of grounding incidents are caused by smaller recreational vessels, large vessel groundings often result in highly visible, immediate resource devastation with long-term impacts. Vessel groundings from large tankers play a role in the history of the Florida Keys and sanctuary and ATBA designations. Within a three-week period in 1989, the M/V *Elpis* and the M/V *Alec Owen Maitland* ran aground on two different shallow bank reefs, and a third vessel, *Mavro Vetrican*, ran aground in Dry Tortugas National Park, killing and displacing corals, gorgonians, and other benthic organisms, in addition to destroying the physical structure of the underlying reef.

These three large vessel groundings were important factors in the 1990 congressional designation of FKNMS and the creation of the ATBA. The ATBA, through sanctuary regulations, prohibits all tank vessels and vessels greater than 50 meters in registered length from entering or operating in the ATBA areas of the Florida Keys. There are four ATBAs in the sanctuary: (1) spanning the length of the Florida Keys from Miami to Key West; (2) in the vicinity of Key West Harbor; (3) in an area surrounding the Marquesas Keys; and (4) in an area surrounding the Dry Tortugas (Figure 4.13).

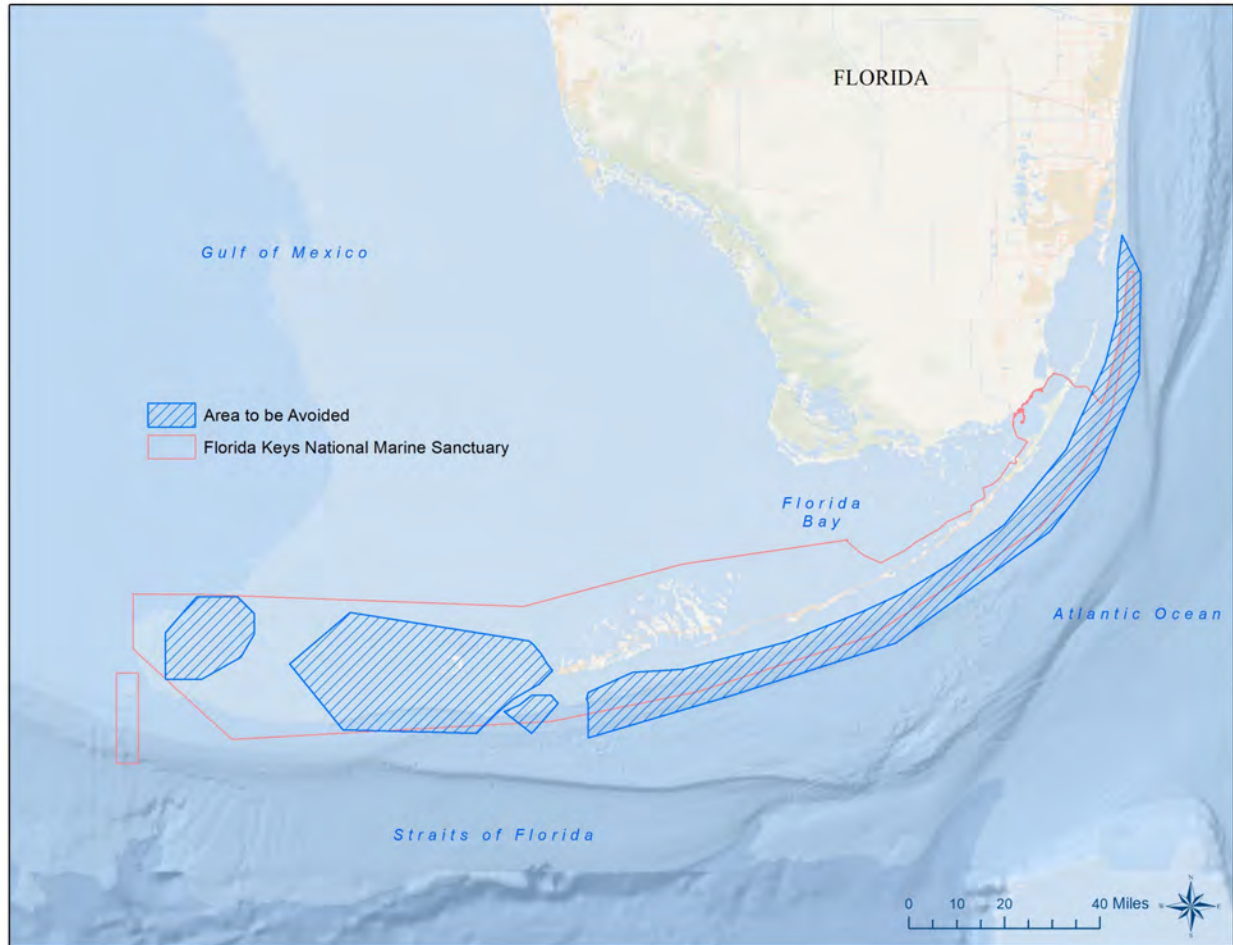


Figure 4.13. Areas to be avoided in Florida Keys National Marine Sanctuary. Image: NOAA

The Florida Keys reef has historically provided hazardous navigational obstacles to shipping. Many known shipwrecks are present throughout the sanctuary. See Section 4.5 for more information on shipwrecks and other submerged cultural and historical resources.

4.6.7.1 Vessel towing/salvage operations

Shallow water habitats of the Florida Keys are susceptible to a variety of direct impacts from smaller commercial and recreational vessels, including damage from the propeller (by impact and prop wash), hull, engine, and keel. Physical impacts can also result from anchors, anchor chains and cables, uncrewed barges, dredge lines, dredge cutter heads, and cables used to tow barges and dredges. Anchor damage, propeller scarring, and other vessel impacts occur frequently and may cause enough damage that impacted reefs and seagrass beds cannot recover (NOAA 2011).

Since tracking began in 2002, there have been an average of 300 to 400 reported vessel groundings throughout FKNMS annually, with 721 reported in 2002, and a general downward trend in subsequent years (FKNMS grounding database data for 2002 through 2012, see Figure 4.14). On average, habitats impacted from these groundings include 80 percent seagrass, 20 percent coral, and a small amount of hardbottom (FKNMS grounding database, see Table 4.4). Impacts to coral can include a combination of framework fracturing; scraping and gouging of coral colonies; dislodging, crushing, and fracturing of

coral colonies; and destruction of the three dimensional structure formed primarily by the coral component of the reef system (USCRTF 1999; Jaap and Morelock 1998). Impacts to seagrass can include propeller scars, blowhole (due in large part to the vessel attempting to power off the seagrass and creating a hole in the seagrass and sediment), and berms resulting from the backwash of sediment from an attempt to power off. For injury to seagrass, recovery time varies from seven to 10 years for prop scars and berms, to decades or indefinitely for blowholes (Uhrin et al. 2011).

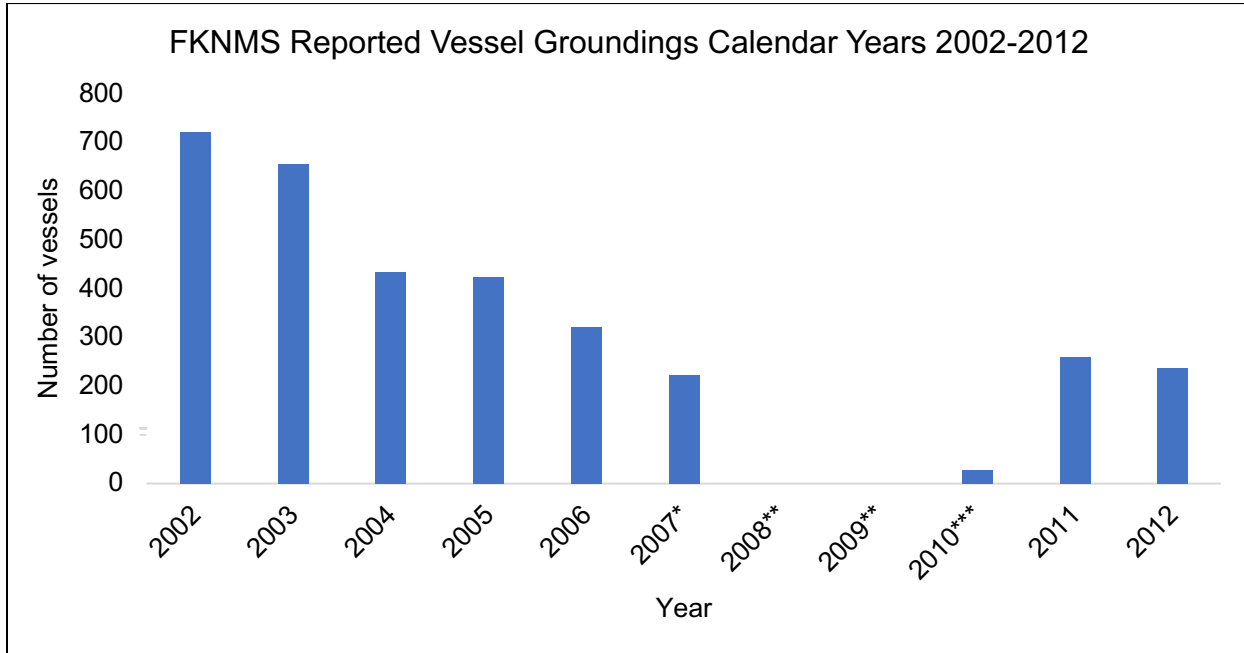


Figure 4.14. Reported vessel groundings in FKNMS, 2002-2012. Source: FKNMS vessel grounding database
* January through July only; ** No data available; *** September through November only

Table 4.4. Percentage of habitat type impacts per annual reported vessel groundings. Source: FKNMS vessel grounding database

Year	Seagrass (78%)	Coral (18%)	Hardbottom (2%)	Cultural (1%)	Mangrove (1%)	Total assessed
2000	16	7	0	0	0	23
2001	54	8	2	0	0	64
2002	69	15	2	0	0	86
2003	65	9	1	0	0	75
2004	52	10	0	0	0	62
2005	28	9	1	0	1	39
2006	30	15	2	0	0	47
2007	22	4	2	1	0	29
2008	10	6	0	0	1	17

2009	16	6	0	0	0	22
2010	4	2	0	0	0	6
2011	13	1	0	1	0	15

Derelict vessels also pose threats to sanctuary resources. Vessels may release debris and hazardous material, and cause repeated and potential damage from the grounded vessel’s long-term presence in the environment. This can be exacerbated by high wave energy and storm events which could move the vessel. Monroe County derelict and abandoned vessel data indicate that approximately 60 to 80 derelict vessels are removed each year.

While some grounded vessels can carefully power off or wait for more favorable conditions (tide, currents, or weather) with little to no additional damage to seagrass, coral, or hardbottom habitats, most grounded vessels require or could benefit from some level of additional vessel and/or equipment support. By nature, derelict vessels will all require additional vessel and/or equipment support for removal.

Towing and salvage operations for recently wrecked or derelict vessels provide this additional vessel and/or equipment support. While these towing/salvage operations are intended to remove the grounded derelict vessel, towing/salvage operations can also impact seagrass, coral hardbottom, and other benthic habitats if not done with appropriate equipment, training, and best practices. The use of best practices reduces the potential for the towing/salvage vessel, equipment, or operation to further impact sanctuary resources. Some examples of best practices include the use of floating lines instead of chain, use of spuds rather than traditional anchors, dismantling the vessel in place, and removing any potential pollutants in advance of operations.

There are currently no sanctuary regulations expressly addressing towing or salvage operations for recently wrecked or derelict vessels. However, permits may be issued for operations that involve otherwise prohibited activities. Prohibited activities that may be relevant for these towing and salvage operations include: alteration of or construction on the seabed; operation of vessels; discharge or deposit of materials or other matter; movement, removal, injury to, or possession of sanctuary historical resources; interference with law enforcement; and operating in the ATBA, EMAs, SUAs, or SPAs.

For towing/salvage operations that involve otherwise prohibited activities outlined above, a letter of authorization or general permit is issued. Applicants that satisfactorily meet FKNMS regulatory review criteria may be eligible to be issued a letter of authorization or general permit for towing/salvage activities. The letter of authorization or general permit outlines conditions that must be followed to ensure protection of sanctuary resources during salvage activities. To date four letters of authorization and five general permits have been issued for this activity.

There are approximately 20 known towing/salvage operators that work within the Florida Keys. Of these only nine have worked under a letter of authorization or general permit. There are also many more individuals that provide towing/salvage support that are not known and do not have proper training, use appropriate equipment, or follow best practices. There is a need for greater oversight of towing/salvage activities due to the nature of the operations and potential for negative impacts to sanctuary resources.

4.6.8 Offshore energy

This section addresses offshore energy development, including oil and gas exploration and energy producing facilities, and alternative energy producing facilities. At present, there are no existing, planned, or reasonably foreseeable offshore energy development projects within FKNMS or the proposed boundary expansion area. The Department of the Interior's Bureau of Ocean and Energy Management (BOEM) conducted an analysis (letter dated October 24, 2018) of the potential for offshore energy development within the current and proposed FKNMS boundaries pursuant to Executive Order 13795 (April 28, 2017), Implementing an America-First Offshore Energy Strategy. BOEM's analysis is summarized here and included in Appendix G.

4.6.8.1 Oil and gas development potential

DOI's analysis showed a possible interest in undiscovered oil and gas resources in the expanded area of FKNMS; however, it cited a high degree of uncertainty on whether economically recoverable hydrocarbon volumes are present in the sanctuary.

4.6.8.2 Alternative energy development

The report indicated a very low potential for wind energy in FKNMS and no interest in offshore wind development within the current or expanded sanctuary boundaries. Interest in developing tidal energy is also low. Additionally, the analysis concluded that the potential impact on the development of methane hydrate resources would be negligible.

4.6.8.3 Offshore marine minerals

DOI expressed some concern that expanding the sanctuary may limit access to dredged sand resources used for beach renourishment in the Miami area and encouraged further coordination with USACE, Florida DEP, and others with possible interest in outer continental shelf sediment resources.

CHAPTER 5

ENVIRONMENTAL CONSEQUENCES

5.1 Introduction

This chapter evaluates the anticipated environmental effects on the biological, physical, cultural and historical, and socioeconomic and human use issues associated with the proposed action and alternatives, including the no action alternative (Alternative 1), presented in Chapter 3. The potential impacts apply to the affected environment described in Chapter 4. Also discussed are the potential cumulative impacts and unavoidable adverse impacts. As described in Chapter 3, the proposed action and alternatives include proposals for changes to five specific components of FKNMS management: (1) the sanctuary boundary, (2) sanctuary-wide regulations, (3) marine zone boundaries within the sanctuary, (4) marine zone regulations, and (5) changes to the sanctuary management plan.

During the public scoping process and Sanctuary Advisory Council review, numerous issues were raised. To the extent that these issues were relevant to the DEIS, they are included in the analysis. Original scoping comments can be found at: <https://www.regulations.gov/docket?rpp=25&po=0&D=NOAA-NOS-2012-0061>.

5.1.1 Scope of the environmental consequences analysis

In this chapter, the potential impacts associated with the proposed action and alternatives are described by their type (direct, indirect, or cumulative) and significance (negligible, less than significant, or significant). The impact analysis considers the beneficial and adverse impacts of each alternative, and the impacts common to all alternatives. The affected resources and types of use examined for the proposed action and alternatives are:

- Biological resources;
- Physical resources;
- Cultural and historical resources; and
- Socioeconomic resources and human uses.

5.1.1.2 Resources not analyzed

Of the resources commonly analyzed during the NEPA process, Table 5.1 provides a list of those not addressed in this DEIS and the rationale as to why the action would not affect these resources.

Table 5.1. Resources not analyzed in this DEIS

Resource	Rationale
Land use	With the exception of the impacts that some land use practices have on water quality (and are covered in cumulative impacts below), no significant land use activities are included in the proposed action or alternatives.
Utilities	None of the alternatives include activities that require or impact utilities.
Visual	None of the alternatives include activities that will impact visual resources.

In addition to the categories of resources listed in Table 5.1, a number of natural and cultural resources discussed in Chapter 4 would not be impacted by any of the proposed actions. These resources are included in Chapter 4 to provide the public with a complete picture of the land and sea ecosystems of the Florida Keys, and specifically the proposed action area.

Physical features discussed in Chapter 4, such as oceanic conditions (i.e. currents, hydrography, and climate), are beyond the scope of plausible effects as their status and equilibrium are largely independent of human-imposed boundaries and policies.

5.1.2 Framework for the consequences analysis

Below describes the framework for the consequences analysis and the basis for NOAA's conclusions regarding the type of potential impacts, significance of potential impacts, and quality of potential impacts.

5.1.2.1 Type of potential impacts

The following categories of types of potential impacts are used to describe the nature, timing, and proximity of potential impacts on the affected environment.

- **Direct impact:** A known or potential impact which is caused by the action and occurs at the same time or place (40 CFR § 1508.8(a)).
- **Indirect impact:** A known or potential impact which is caused by the action and is later in time or farther removed in distance, but is still reasonably foreseeable (40 CFR § 1508.8(b)).
- **Cumulative impact:** The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR § 1508.7).

5.1.2.2 Significance of potential impacts

To determine whether an impact is significant, the Council on Environmental Quality (CEQ) regulations (40 CFR § 1508.27) and NOAA guidance (NAO 216-6A) require the consideration of context and intensity of potential impacts.

Context is the setting within which an impact is analyzed, such as the affected region or locality and the affected interests. In this DEIS, the direct and indirect impacts are evaluated within a local context, primarily examining how each alternative would affect the human environment within a specified portion of the sanctuary, and whether those effects would be short-term or long-term. The geographic area of interest for cumulative impacts is a slightly broader regional (i.e., Florida Keys and Southeast Florida) context in order to consider overlapping and compound effects with other past, present, or reasonably foreseeable future actions.

Level of intensity refers to the severity of the impact. The various levels of impact used in this analysis are:

- **Negligible:** Impacts to a resource can barely be detected (whether beneficial or adverse) and are therefore discountable.
- **Less than significant:** Minor impacts that do not rise to the level of significance as defined below.

- **Significant:** Impacts resulting in an alteration in the state of a biological, physical, cultural and historical, or socioeconomic resource. Long-term or permanent impacts or impacts with a high intensity or frequency of alteration to a resource, whether beneficial or adverse, would be considered significant. The significance threshold is evaluated on a case-by-case basis, taking into consideration the context and intensity of each action.

5.1.2.3 Quality of potential impacts

Potential impacts are described as either beneficial or adverse as follows:

- **Beneficial impact:** Beneficial impacts are believed to promote favorable conditions for the resource.
- **Adverse impact:** Adverse impacts are considered contrary to the goals, objectives, management policies, and practices of NOAA and the public interest or welfare. These impacts are likely to be damaging, harmful, or unfavorable to one or more of the resources.

5.1.4 Overview of the environmental consequences analysis

Sections 5.2 through 5.6 evaluate the impacts of the four alternatives on the resource areas described in Chapter 4. NOAA evaluated the impacts within the context of each of the following alternative components:

Sanctuary boundary:

How does the amount of area within FKNMS affect the human and natural environment?

Sanctuary-wide regulations:

How do the type and amount of regulations to protect sanctuary resources affect the human and natural environment?

Marine zone boundaries and regulations:

How does the amount of area within each marine zone and the management approach for each marine zone affect the human and natural environment?

FKNMS management plan:

How do the activities to manage and operate FKNMS affect the human and natural environment?

To efficiently evaluate the potential impacts from the alternatives, NOAA first evaluated the impacts common to all alternatives and then considered the impacts specific to each alternative, as summarized below.

Common impacts: Section 5.2 describes the impacts that would be the same for all alternatives, such as the impacts from managing and operating the sanctuary (Section 5.2.1) and impacts to protected species and habitats (Section 5.2.2).

Impacts from Alternative 1: Section 5.3 describes the impacts from the no action alternative (Alternative 1) whereby NOAA would continue to manage FKNMS within the current boundary and under the current regulations, zoning regime, and management plan.

Impacts from Alternative 2: Section 5.4 describes the impacts specific to Alternative 2, which would expand the sanctuary, revise and add new regulations to protect sanctuary resources, expand the marine zones, make the regulations within certain marine zone more protective of sanctuary resources, and update FKNMS management plan to respond to current threats to sanctuary resources and increase public involvement and outreach.

Impacts from Alternative 3: Section 5.5 describes the impacts specific to Alternative 3. Because many of the components of alternatives 2 and 3 are the same, this section also briefly summarizes the impacts that would be the same as those described for Alternative 2.

Impacts from Alternative 4: Section 5.6 describes the impacts specific to Alternative 4. Because many of the components of alternatives 2, 3, and 4 are the same, this section also briefly summarizes the impacts that would be the same as those described for alternatives 2 and 3.

5.2 Impacts common to all alternatives

Under the no action alternative and alternatives 2, 3, and 4, FKNMS would continue to conduct existing field operations to protect and manage sanctuary resources. These operations include: operating and maintaining vessels and aircraft, training staff, conducting research and resource documentation, implementing education and outreach activities, and installing and maintaining permanent moorings or other installations to protect fragile ecosystem or cultural and historical resources.

5.2.1 Impacts of existing field operations to biological, physical, cultural, and socioeconomic resources (common to all alternatives)

NOAA analyzed the impacts from management and operational activities at FKNMS in its draft Programmatic Environmental Assessment for Field Operations in the Southeast and Gulf of Mexico National Marine Sanctuaries (PEA) (NOAA 2018b). NOAA indicated that operating FKNMS would result in overall **beneficial** effects to the environment because managers would gain information to inform decisions related to resource protection activities; the public would become more educated about sanctuary resources; important habitat and wildlife would continue to be protected and managed; and damaged resources would be restored. In addition, NOAA identified some **direct** and **indirect adverse** impacts, such as minor disturbances to habitats and wildlife from NOAA vessel operations and research activities. A summary of these beneficial and adverse impacts is provided in Table 5.2.

NOAA indicated in the draft programmatic environmental assessment that the adverse effects of field operations would be **less than significant** because the activities would be short-term and localized, and FKNMS would employ a variety of best management practices to avoid or minimize impacts to the natural and human environment. Given that the draft PEA describes the impacts from field operations at FKNMS, and those activities would continue under all of the alternatives, NOAA incorporates by reference the analysis within the draft PEA within this draft environmental impact statement (NOAA 2018b, <https://sanctuaries.noaa.gov/management/environmental-compliance/>).

Table 5.2. Summary of impacts from the existing field operations at Florida Keys National Marine Sanctuary

Resource	Activity	Impacts
Biological Resources		
Habitat	Debris removal, biological monitoring of biota and habitat conditions or other on-shore research activities, and educational outreach activities	<ul style="list-style-type: none"> • Direct beneficial impacts due to habitat improvements when debris is removed. • Indirect beneficial impacts from biological monitoring information and research activities that provide information to enhance management of the sanctuary. • Indirect beneficial impact from increased awareness among members of the public who participate in educational or outreach activities. • Negligible adverse impact if research activities require localized, short-term disturbance to habitats, such as collection of habitat-building species (e.g., corals). The impact would be minimized with the implementation of best management practices.
	Removal of derelict vessels, installation of mooring buoys, and offshore research activities, including the use of airplanes, vessels, and deployment of research equipment	<ul style="list-style-type: none"> • Less than significant beneficial impact due to the removal of derelict vessel which would result in increased habitat availability and improved habitat quality. The use of mooring buoys prevents habitat degradation by not allowing anchoring and disturbing benthic habitats. • Less than significant adverse impact due to localized, short-term disturbance to habitats from equipment used to remove derelict vessels and the installation of mooring buoys. Habitat that could be directly disturbed would be very small (generally <10 ft² [1m²]) and the change may not be noticeable with the implementation of best management practices that minimize the likelihood of disturbing important habitats.
	Vessel and aircraft operation	<ul style="list-style-type: none"> • Negligible adverse impact due to potential localized disturbances to benthic habitats if vessels anchor in an area without mooring buoys. However, relatively infrequent use of sanctuary vessels and aircraft, training requirements for vessel operators and pilots, and adherence to ONMS best management practices and NOAA Small Boat Program guidelines would limit impacts.
Biota	Biological monitoring, research activities, and educational outreach activities	<ul style="list-style-type: none"> • Less than significant direct adverse impact due to the localized collection of organisms during monitoring or research activities. Sampling activities would likely result in negligible impacts on marine biota populations due to the small sample sizes typically collected. • Less than significant adverse impact due to the potential localized disturbance to the benthic habitats during anchoring (when mooring buoys are not available) and unintentional striking or grounding of operational aircraft or vessels. Impact would be

		<p>negligible due to the low likelihood of occurrence, training requirements for vessel operators and pilots, and adherence to ONMS best management practices and NOAA Small Boat Program guidelines. Effects due to noise-producing activity that may cause biota to be disturbed or displaced would be minimal, because human activities are limited to a certain portion of the sanctuary, would occur for limited amounts of time, and staff would implement best management practices to minimize the disturbances.</p> <ul style="list-style-type: none"> • Indirect beneficial impacts from biological monitoring information and research activities that provide information to enhance management of the sanctuary. • Indirect beneficial impact from increased awareness among the members of the public who participate in educational or outreach activities.
	Debris removal and disentangling trapped marine mammals, turtles, or other species	<ul style="list-style-type: none"> • Direct beneficial impacts to marine organisms and wildlife due to the increased health and safety conditions when debris is removed and organisms are disentangled. • Indirect beneficial impact from increased awareness among members of the public who participate in educational or outreach activities. • Negligible adverse impact due to noise-producing activity that may cause biota to be disturbed or displaced for short period of time.
	Vessel and aircraft operations	<ul style="list-style-type: none"> • Negligible adverse impact from potential localized disturbance to the benthic immobile organisms during anchoring (when mooring buoys are not available) and unintentional striking or grounding of operational aircraft or vessels. Impact would be negligible due to the low likelihood of occurrence, training requirements for vessel operators and pilots, and adherence to ONMS best management practices and NOAA Small Boat Program guidelines.
Physical resources		
Geology	Removal of derelict vessels, installation of mooring buoys, and research activities, including the use of airplanes and vessels and deployment of research equipment	<ul style="list-style-type: none"> • Less than significant adverse impact due to the direct disturbance to the seafloor. However, the area of impact would be very small (generally <10 ft² (1m²)) and the change may not be noticeable with the use of best management practices that minimize the likelihood of disturbing important seafloor structures. • Less than significant beneficial impact from removal of derelict vessels, prevention of anchoring upon sensitive seafloor areas, and research activities that would provide characterization of the seafloor and other information that would enhance the management of the sanctuary.

	Vessel and aircraft operations	<ul style="list-style-type: none"> • Negligible adverse impact due to the low likelihood of unintentional striking or grounding of operational aircraft or vessels, training requirements for vessel operators and pilots, and adherence to ONMS best management practices and NOAA Small Boat Program guidelines.
Water quality	Removal of derelict vessels, installation of mooring buoys, and research activities, including the use of airplanes, vessels, and deployment of research equipment	<ul style="list-style-type: none"> • Less than significant adverse impact due to the minimal potential for localized decline in water quality if gas, fuel, or other contaminants leak or spill during derelict vessel collection or unintended fuel, lubricant, sewage, or garbage spills from sanctuary vessels. Adherence to ONMS best management practices and NOAA Small Boat Program guidance would also minimize impacts. Research equipment would not directly discharge harmful waste into the water. • Less than significant beneficial impact from removal of derelict vessels that may be leaking and characterization of the seafloor and other information provided by research activities that would enhance management of the sanctuary.
Air quality	Vessel and aircraft operations and use of research equipment	<ul style="list-style-type: none"> • Less than significant or negligible adverse impact from the low generation of emissions during operation of sanctuary aircraft, vessel operation and maintenance, and use of research equipment. Vehicles and equipment would be used infrequently, and adherence to ONMS best management practices and NOAA Small Boat Program guidelines would minimize impacts.
Cultural and historical resources		
Cultural and historical resources	Deployment of equipment (e.g., autonomous underwater vehicles/remotely operated vehicles/gliders/drifters, seafloor equipment, and remote sensing equipment)	<ul style="list-style-type: none"> • Positive and beneficial effects are anticipated with these activities because they lead to enhanced resource characterization and the location and documentation of new archaeological sites. These activities also raise public awareness and foster greater appreciation of the sanctuary's maritime archaeological history. • Less than significant beneficial effects by fostering learning opportunities about sanctuary resources so that managers can better protect these resources. • Less than significant adverse impacts are possible from these activities; however, they are minimized by training operators and using equipment that is very visible to the public. Additionally, there may be impacts from the highly improbable physical impact of the equipment on heritage resources and a slightly increased risk of memento-seekers carrying off important newly documented historical resources.

	Onshore fieldwork and other sampling activities	<ul style="list-style-type: none"> • Less than significant beneficial effects by promoting understanding and protection of resources that can lead to enhanced environmental stewardship. These activities also help managers locate and document new archaeological sites. • Less than significant adverse impacts by using best management practices to ensure there is no unnecessary harm to the surrounding environment. Some sampling activities could occur in the vicinity of historical and cultural resources, but these activities will be conducted by knowledgeable personnel working in compliance with the National Historic Preservation Act (NHPA).
	Snorkel, scuba, vessel, and aircraft operations	<ul style="list-style-type: none"> • Less than significant beneficial effects because these projects are long-term and designed to protect, restore, and preserve maritime resources. • Less than significant adverse impacts from accidental or improper diving or snorkeling actions or overuse of specific locations. These may be mitigated by the use of best management practices. • Negligible effects are anticipated from non-motorized vessels because they are lightweight, slow, and maneuverable, and therefore able to avoid contact with sensitive historical and cultural resources. The effects of vessel and aircraft operations are also expected to be negligible due to their infrequent activity (fewer than ten flights per year). Vessel operations would employ best management practices and impacts would not be concentrated in any one area.
Socioeconomics		
Marine transportation	Sampling activities	<ul style="list-style-type: none"> • Less than significant beneficial impacts because scientific study and inquiry create greater awareness and appreciation of sanctuary resources and promote public and commercial uses. • Less than significant adverse effects by operations that may temporarily interfere with the conduct of commercial or recreational activities, but these effects are expected to be short-term and localized.
	Deployment of equipment	<ul style="list-style-type: none"> • Less than significant beneficial impacts from deployment of buoys that assist in navigation. Data generated by seabed-deployed equipment can increase knowledge of sanctuary resources, leading to better resource management. Additional bathymetry knowledge is used to aid in marine navigation.

		<ul style="list-style-type: none"> • Negligible adverse effects because buoys and other equipment may temporarily interfere with the conduct of commercial or recreational activities (such as fishing or transit), but most operations are limited in scope and time.
	Aircraft operations	<ul style="list-style-type: none"> • Less than significant beneficial impacts from species and habitat surveys that can lead to better characterization of habitats and species, aiding in education and outreach efforts which aim to increase informed management decisions.
Research and education	Sampling activities	<ul style="list-style-type: none"> • Less than significant beneficial impacts from research and monitoring programs, which offer related socioeconomic opportunities to users and constituents. • Less than significant adverse effects by operations that may temporarily interfere with the conduct of commercial or recreational activities, but these effects are expected to be short-term and localized.
	Deployment of equipment	<ul style="list-style-type: none"> • Less than significant beneficial impacts because research and education benefit sanctuary resources and can benefit small businesses. • Negligible adverse effects because buoys and other equipment may temporarily interfere with other activities, but operations are limited in scope and time.
	Aircraft operations	<ul style="list-style-type: none"> • Less than significant beneficial impacts from species and habitat surveys that can lead to better characterization of habitats and species, aiding in education and outreach efforts which aim to increase informed management decisions.
Fishing, recreation, and tourism	Research and educational outreach activities (onshore and vessel operations)	<ul style="list-style-type: none"> • Less than significant beneficial impacts on trade, tourism, recreation, and commerce in the area, which greatly depend on the long-term health of the sanctuary and may benefit from knowledge gained through research and outreach activities.
	Deployment of navigational buoys and research equipment	<ul style="list-style-type: none"> • Less than significant adverse impacts from short-term and localized interruptions to recreational and commercial activities. • Less than significant beneficial long-term effects to safety and knowledge for better management of sanctuary resources. • Negligible impacts from incremental addition of markers to existing marker network and short-term interference with other activities.

	Aircraft operations	<ul style="list-style-type: none">• Less than significant beneficial long-term and short-term gains to knowledge for better management of sanctuary resources.
	Vessel maintenance	<ul style="list-style-type: none">• Negligible impacts because vessel maintenance is conducted pier-side or on land, and therefore would not significantly interfere with other activities.

5.2.2 Impacts to federally protected species and habitats (common to all alternatives)

Managing and operating the sanctuary could impact species and habitats protected under the Endangered Species Act (ESA), Essential Fish Habitat (EFH) protected under the Magnuson–Stevens Fishery Conservation and Management Act (MSA), and migratory birds protected under the Migratory Bird Treaty Act (MBTA). NOAA analyzed the potential environmental consequences to protected species and habitats within the regulatory framework of the relevant statute. Statute-specific determinations are defined below. See Appendix D for additional information regarding these consultations, the Marine Mammal Protection Act (MMPA), and the regulatory framework for other federal and state laws, and a summary of the memoranda of agreement and understanding between NOAA and the state of Florida.

5.2.2.1 Endangered Species Act

This section describes the potential impacts to species listed under the ESA and their designated critical habitat. NOAA analyzed the potential impacts to ESA-listed species and designated critical habitat within the context of the ESA regulatory framework, including ESA-specific determinations regarding the potential impacts to listed species and designated critical habitat.

For ESA-listed species, effect determinations include the following:

- No effect: When the proposed action will not affect a listed species or designated critical habitat.
- May affect, but not likely to adversely affect: When effects on listed species are expected to be discountable, insignificant, or completely beneficial.
 - Beneficial effects: Contemporaneous positive effects without any adverse effects to the species.
 - Insignificant effects: Relate to the size of the impact and should never reach the scale where take occurs.
 - Discountable effects: Those extremely unlikely to occur.
- May affect, and is likely to adversely affect: If any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial.

For designated critical habitat, the effect determination must discuss whether the proposed action may result in a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of an ESA-listed species.

5.2.2.1.1 ESA-listed species under NMFS jurisdiction

Section 4.2.3.1 describes the 23 species under NMFS jurisdiction that may occur in the action area. The below analysis evaluates the potential adverse and beneficial impacts to these listed species.

Impacts to ESA-listed marine mammals, sea turtles, and fish under NMFS jurisdiction

As described in Section 4.2.3.1, NOAA determined that six species of marine mammals, five species of sea turtles, and five species of fish listed under the ESA may occur within the action area. The potential routes of effect of the proposed actions to these species include disturbances from human and vessel activities, entanglement, vessel strikes, and water quality degradation, as well as potential beneficial

impacts from restricting recreational activities in certain areas of FKNMS, improvements in water quality, and protection of marine habitat.

Disturbances from human and vessel activities

When NOAA-authorized vessels transit throughout the sanctuary, a minor acoustic disturbance from engine noise is a potential impact on marine mammals, sea turtles, and fish. If any listed species were to be within close enough proximity to a vessel, the interaction could result in a response ranging from no reaction to a startled reaction that leads to a rapid fleeing from the area. Sea turtles, whales, and fish usually avoid human activity. As a result, the most likely effect from this interaction would be a moderate to high energy avoidance behavior resulting in the animal temporarily leaving the immediate area unharmed. This disturbance would be brief and is not likely to significantly impact the organism's ability to feed, reproduce, or avoid predators. In addition, noise and recreational activity levels during the next five to 10 years are expected to remain similar to current levels. Listed species within portions of the sanctuary with vessel traffic are likely familiar with the current levels of recreational and operational activities. Therefore, future human activity is unlikely to cause listed species to avoid or abandon habitat within the action area.

Human and vessel disturbances would be minimized because many portions of FKNMS restrict human activity within areas that provide important habitat for listed species. As described below, under "Protection of marine habitat," the level of protection would increase if the sanctuary is expanded and new regulations are implemented. Current and proposed revisions to include the new no motor, no entry, and shoreline slow speed marine zones would limit noise and disturbance from vessel activities. In addition, disturbances from recreational use would be minimized because many management plan activities involve educating the public about and promoting the responsible use of sanctuary resources (see Section 3.5). These public outreach and educational activities would help ensure that the public is aware of the need to avoid or minimize disturbing listed species.

In summary, human and vessel disturbances within FKNMS would be **insignificant** or **discountable** given that noise from recreational or operational activity would be of limited duration, NOAA-authorized vessels would follow best management practices, disturbed individuals could move to adequate suitable habitat nearby, and public outreach efforts would help minimize any negative effects from public use. The proposed action would also result in **beneficial** impacts because human activity would be restricted within portions of the sanctuary, particularly those areas known to be used by these listed species.

Entanglement

Entanglements can create physical damage to an animal through constriction which can partially sever limbs or flippers, create penetrating injuries, and can potentially immobilize an animal (Andersen et al. 2008; Parga 2012). If an entanglement is severe enough, it may also result in drowning. The potential for entanglement could occur if a listed species encounters mooring buoy lines, or during the implementation of management plan activities that require long line attachments, such as some field research and restoration activities. The risk of entanglement is greater for marine mammals and sea turtles than fish due to their movements and size. Nonetheless, the likelihood that any listed species would come in contact with a NOAA-authorized vessel or other FKNMS gear would be highly unlikely based on the species distribution and abundance within the action area, adherence to ONMS best management practices that include maintaining a watch for listed species around research vessels, and termination of some operations if listed species are observed. (See the supporting material for this DEIS at

floridakeys.noaa.gov/blueprint for a full description of best management practices.) Therefore, NOAA has determined that the likelihood of an entanglement of a listed marine mammal, sea turtle, or fish species would be **discountable**.

Vessel strike

ESA-listed vertebrates that collide with vessels could be injured or killed by the vessel strike. The risk of a collision is greater for marine mammals and sea turtles than fish due to their movements and size. Nonetheless, NOAA determined that the proposed action would result in an unlikely potential for vessel strikes because of the relatively few NOAA-authorized vessel trips that would occur each year. The sanctuary expansion could result in a small increase in vessel traffic within the proposed expanded area as a part of NOAA's regulatory enforcement, research, and educational activities. NOAA-authorized vessels would follow standing orders imposed by ONMS management to minimize impacts on resources, particularly sea turtles and marine mammals, within the sanctuary and while transiting between sites or from/to shore. These standing orders include keeping a sharp lookout, staying at the helm, and maintaining a cautious distance from whales. Due to the implementation of best management practices, the lack of previous collisions between NOAA-authorized vessels and listed species during the past several decades, and a similar level of vessel traffic within the foreseeable future, the potential for the proposed action to result in vessel strikes with listed species is extremely unlikely and **discountable**.

Changes to water quality

The proposed action could result in both adverse and beneficial impacts to water quality. Adverse impacts could occur if a listed species comes into contact with waste or discharge from NOAA-authorized vessels. Possible pollutants which could pose a risk to listed species include (but are not limited to) oil, fuel, detergents, and hydraulic fluid. In order to minimize the likelihood of a listed species coming into contact with waste or discharge from NOAA's vessel activities, FKNMS staff would adhere to discharge protocols and U.S. laws and regulations that implement the International Convention for the Prevention of Pollution by Ships, widely known as MARPOL 73/78. Sanctuary staff would also follow NOAA guidance for vessel operations in the presence of marine protected species, which include: follow all EPA vessel general permits and USCG requirements, avoid discharge of ballast water in designated critical habitat, avoid cleaners with nonylphenols, use anti-fouling coatings, and clean hull regularly to remove aquatic nuisance species. These best management practices greatly reduce the risk of a spill or leak. If a spill or leak did occur, only a small amount of area would experience a localized, temporary decrease in water quality because the plume of contamination would dissipate quickly. Based on NOAA's use of the best management practices and the protocols mentioned, as well as the low likelihood of a spill, NOAA has determined that the likelihood of a listed species coming into contact with waste or discharge from FKNMS vessels would be very low – particularly because the ESA-listed species are sparsely distributed throughout the action area and are limited in abundance. Therefore, the impacts of changes to water quality on ESA-listed species would be **insignificant**.

The proposed action would also result in beneficial impacts from water quality and habitat improvements. The sanctuary's management activities include removal of derelict vessels that may be leaking pollutants (e.g., oil, fuel, detergents) and enforcement of current regulations that restrict certain discharges in the sanctuary. In addition, alternatives 2, 3, and 4 would update regulations, such as the restrictions on cruise ship discharges and new derelict vessel regulations, to further minimize the potential for pollutants to enter the sanctuary. Therefore, the proposed action would have a **beneficial** impact on listed species.

Protection of marine habitat

Marine habitats would continue to be protected under the no action alternative. Additional habitat would be protected under alternatives 2, 3, and 4, which are listed in order of increasing habitat protection. For example, certain activities that could degrade the quality of marine habitats would be restricted to varying degrees under all four alternatives, and the permitting process would help to ensure that the impacts from any activities that could harm sanctuary resources would be minimized. In addition, habitat disturbances from recreational use would be minimized because many management plan activities involve educating the public about and promoting the responsible use of sanctuary resources (see Section 3.5). These public outreach and educational activities would help ensure that the public is aware of the need to avoid or minimize impacts to habitat for listed species. Therefore, the proposed action would have a **beneficial** impact on listed species by protecting habitat used by listed species.

Impacts to ESA-listed invertebrates under NMFS jurisdiction

As described in Section 4.2.3.1, NOAA determined that seven species of invertebrates listed under ESA may occur within the action area. All seven species of ESA-listed invertebrates that may occur within the action area are immobile (see Appendix E). Potential adverse impacts to these species include direct disturbances and degradation of water quality. Potential beneficial impacts to these species include protection from direct disturbances and improvements in water quality.

Direct disturbances

Listed corals could be affected by some sanctuary management activities that would directly disturb immobile invertebrates, such as buoy and navigational signage installation. Though highly unlikely, corals could be directly disturbed by the installation of mooring buoys. However, direct impacts would likely be avoided because sanctuary staff would select locations to place buoy anchors or navigational signage that include bare bottom substrate to limit any possible adverse disturbances to listed species or other immobile species. In addition, the disturbed area would be extremely limited (less than approximately 10 square feet).

Other physical direct disturbances to listed invertebrate species could occur from recreational activities, such as boating and diving. Such activities would be limited in frequency and duration. In addition, disturbances from recreational use would be minimized because many management plan activities involve educating the public about and promoting the responsible use of sanctuary resources (see Section 3.5). These public outreach and educational activities would help ensure that the public is aware of the need to avoid or minimize disturbing listed species.

Based on the negligible potential for direct disturbances and the implementation of public outreach activities, NOAA determined that the potential impact to listed invertebrates is **discountable**.

As described above, human and vessel disturbances would be minimized because many portions of FKNMS restrict human activity within areas that provide important habitat for listed species. This level of protection would increase if the sanctuary is expanded and additional regulations are implemented. Therefore, the proposed action would also result in **beneficial** impacts to listed invertebrate species.

Changes to water quality

Maintenance and other management activities may affect water quality and habitat quality for sessile invertebrates that cannot move to avoid localized plumes of pollutants. Potential negligible adverse impacts could result from installation of mounting hardware for mooring buoys. These activities may

cause localized and temporary increases in water turbidity during the installation process. However, effects on ESA-listed corals would be **insignificant** because of the small amount of chemical that would be used and because those chemicals would quickly dissipate. Grounded vessel removal may also have a temporary adverse impact on a small area of ESA-listed invertebrates because there is the potential for chemical seepage and habitat disturbance during the removal and, if needed, remediation processes. These activities could also result in a slight temporary increase in turbidity in and near the site. To minimize impacts, NOAA would work with the towing and salvage industry to develop a suite of guidelines and best management practices and apply the current general permit to certain towing and salvage operations. Based on the small amount of area that could experience a localized temporary decrease in water quality, NOAA determined that the potential impacts to listed species from degradation in water quality is **discountable**.

As described above, the proposed action would also result in beneficial impacts to water quality from the removal of derelict vessels that may be leaking pollutants and enforcement of current regulations that restrict certain discharges in the sanctuary. In addition, alternatives 2, 3, and 4 would update FKNMS regulations to further minimize the potential for pollutants to enter the sanctuary, including updating the restrictions on cruise ship discharges and adding a new regulation pertaining to derelict vessels. Therefore, the proposed action would have a **beneficial** impact on listed invertebrate species.

Protection of habitat and benthic sessile listed species

As described above, marine habitats would continue to be protected under the no action alternative, and additional habitat would be protected under alternatives 2, 3, and 4, which are listed in order of increasing habitat protection. For example, certain activities that could degrade the quality of marine habitats would be restricted and the permitting process would help to ensure that the impacts from any activities that could harm sanctuary resources would be minimized. In addition, habitat disturbances from recreational use would be minimized because many management plan activities involve educating the public about and promoting the responsible use of sanctuary resources (see Section 3.5). These public outreach and educational activities would help ensure that the public is aware of the need to avoid or minimize impacts to habitat for listed species. Therefore, the proposed action would have a **beneficial** impact on listed species by protecting habitat used by listed species.

Impacts to designated critical habitat under NMFS jurisdiction

Loggerhead sea turtle (*Caretta caretta*)

As described in Section 4.2.3.1 and in Appendix E, designated critical habitat for the loggerhead sea turtle occurs throughout the action area. Routine sanctuary management activities such as vessel operations, debris removal, and monitoring would have minimal adverse effects on designated critical habitat for the loggerhead sea turtle. The activities that may potentially lead to disturbance include walking along beaches, vessel grounding, and pollution discharging in nearshore seagrass habitats. All of these activities would be limited in duration and extent and education and outreach efforts would minimize negative effects. Beneficial effects from the actions described in this DEIS would include expanding sanctuary boundaries and regulations, which would protect habitats and water quality, as well as protecting seagrass foraging habitat and nesting beaches through updated regulations and marine zones. NOAA has determined that the proposed action **would not adversely modify** loggerhead sea turtle designated critical habitat.

As described above, marine habitats would continue to be protected under the no action alternative, and additional habitat would be protected under alternatives 2, 3, and 4, which are listed in order of increasing habitat protection. In addition, public outreach and educational activities would help ensure that the public is aware of the need to avoid or minimize impacts to designated critical habitat. Therefore, the proposed action would have a **beneficial** impact on loggerhead sea turtle designated critical habitat.

Elkhorn (*Acropora palmata*) and staghorn (*Acropora cervicornis*) corals

As described in Section 4.2.3.1, designated critical habitat for these corals occur in the Dry Tortugas and on the Atlantic side of the Florida Keys from Key West National Wildlife Refuge to Dania Beach. Direct effects to designated critical habitat could occur from buoy and navigational signage installation. These impacts would be avoided because sanctuary staff would select locations to place buoy anchors or navigational signage that include bare bottom substrate to limit any possible adverse disturbances to designated critical habitat. In addition, the disturbed area would be extremely limited (less than approximately one square meter). Beneficial impacts to designated critical habitat would include the boundary expansion; more protective marine zones; more protective regulations, such as restrictions on vessel size on mooring buoys; and implementation of management plan activities, such as planning and support of coral restoration projects. NOAA has determined that the proposed action **would not adversely modify** elkhorn or staghorn critical habitat.

As described above, marine habitats would continue to be protected under the no action alternative, and additional habitat would be protected under alternatives 2, 3, and 4, which are listed in order of increasing habitat protection. In addition, public outreach and educational activities would help ensure that the public is aware of the need to avoid or minimize impacts to designated critical habitat. Therefore, the proposed action would have a **beneficial** impact on elkhorn and staghorn designated critical habitat.

Smalltooth sawfish (*Pristis pectinata*)

As described in Section 4.2.3.1, designated critical habitat for smalltooth sawfish includes Florida Bay and borders FKNMS from Blackwater Sound southwest to Long Key. Indirect impacts to this designated critical habitat could occur from localized declines in water quality due to vessel operations, mooring buoy and signage installation, debris removal, and derelict vessel removal. These activities may cause localized and temporary increases in water turbidity during the installation or removal process. However, effects on designated critical habitat would be insignificant because of the small amount of chemicals that would be used and because any inadvertent release of chemicals would quickly dissipate. To minimize impacts, NOAA would work with the towing and salvage industry to develop a suite of guidelines and best management practices and apply the current general permit to certain towing and salvage operations. Based on the small amount of area that could experience a localized, temporary decrease in water quality, NOAA has determined that the proposed action **would not adversely modify** smalltooth sawfish critical habitat.

As described above, marine habitats would continue to be protected under the no action alternative, and additional habitat would be protected under alternatives 2, 3, and 4, which are listed in order of increasing habitat protection. In addition, public outreach and educational activities would help ensure that the public is aware of the need to avoid or minimize impacts to designated critical habitat. Therefore, the proposed action would have a **beneficial** impact on smalltooth sawfish designated critical habitat.

Conclusion for ESA-listed species and designated critical habitat under NMFS jurisdiction

NOAA determined that 23 federally listed species and designated critical habitats for three species under NMFS jurisdiction may occur within the action area. The proposed action would result in beneficial, insignificant, or discountable impacts to these species and would not adversely modify designated critical habitat for the following reasons:

1. Disturbance, vessel collision, and entanglement is highly unlikely due to NOAA's implementation of best management practices and the relatively low level of vessel activity that would occur within the sanctuary.
2. Noise and disturbances from recreational or operational activity would be of limited duration, human activity would be restricted within several portions of the sanctuary, and management activities and outreach would help to reduce disturbance.
3. The proposed action would result in beneficial impacts because marine habitats would continue to be protected under the no action alternative, and additional habitats would be protected under alternatives 2, 3, and 4, which are listed in order of increasing habitat protection.

Based on the above information, NOAA finds that the proposed action **may affect, but is not likely to adversely affect** ESA-listed species under NMFS jurisdiction (see Appendix E for full list). In addition, the proposed action **would not adversely modify** designated critical habitat under NMFS jurisdiction.

5.2.2.1.2 ESA-listed species under USFWS jurisdiction

Section 4.2.3.1 describes 55 federally listed species under USFWS jurisdiction that occur in the action area. In that section, NOAA concludes that 25 of these species would not occur in the action area because those species are extirpated from the area or no suitable habitat occurs within the action area. The analysis below evaluates the possible routes of effect and potential impacts to the remaining 30 listed species. The analysis below includes potential adverse impacts from human disturbances and water quality degradation, as well as potential beneficial impacts from restricting recreational activities in certain areas, improvements in water quality, and protection of wetland and mangrove habitats.

Impacts to ESA-listed birds, terrestrial mammals, and insects under USFWS jurisdiction

In Section 4.2.3.1, NOAA determined that 12 species of birds, nine species of terrestrial mammals, and four species of insects may occur within the action area. Potential adverse impacts to all of these species include human disturbances from recreational and sanctuary management activities and potential degradation of water quality. Potential beneficial impacts include the potential improvements in water quality and protection of wetland and mangrove habitats.

Human disturbances

Intense human disturbance may disrupt nesting, foraging, or resting activities for listed birds and terrestrial species. For example, intense disturbances to birds can reduce their ability to maintain adequate weight or provide sufficient care to eggs or chicks (USFWS 2007, Niles 2009, USFWS 2015).

Within FKNMS, human disturbance is limited to vessel traffic and noise from recreational activities, removal of marine debris, and vessel traffic to support operations of the sanctuary, such as research or educational activities. Noise from these activities could disturb or displace listed birds or terrestrial mammals within an audible range of the sanctuary. However, this noise would be of short duration and within a limited portion of the sanctuary. In addition, some species would be more susceptible to these

disruptions. The piping plover, for example, may be subject to slightly more disturbances from normal sanctuary management activities because this species spends more time foraging near or on water, whereas other listed species are more commonly found inland, where the noises would be less audible. For some species, human activities may be more likely to disrupt certain behaviors. For example, USFWS (2007) determined that human disturbances may disrupt nesting behavior for the wood stork, but the USFWS did not find evidence that human disturbances significantly affect foraging behavior for the wood stork.

If noise levels were audible enough to disturb listed terrestrial species, adequate similar habitat could be found nearby in other portions of the sanctuary that would be beyond the audible range of sanctuary activities. In addition, noise and recreational activity levels during the next five to 10 years are expected to remain similar to current levels. Therefore, listed birds within active portions of the sanctuary are likely familiar with the current levels of recreational and operational activities within FKNMS and future human activity is unlikely to cause listed terrestrial species to avoid or abandon habitat within the action area.

Human disturbances would be minimized because many portions of FKNMS restrict human activity within several areas of the sanctuary that provide important habitat for listed species. As described below, under “Protection of wetland and mangrove habitats,” the level of protection would increase if the sanctuary is expanded and new regulations are implemented. For example, current and proposed revisions to include the new no motor, no entry, and shoreline slow speed marine zones would limit noise and disturbance from human activities. Restricting activities within certain portions of the sanctuary would result in beneficial impacts.

In addition, disturbances from recreational use would be minimized because many management plan activities (see Section 3.5) involve educating the public about and promoting the responsible use of sanctuary resources. These public outreach and educational activities would help ensure that the public is aware of the need to avoid or minimize disturbing listed species.

In summary, human disturbances to listed birds and terrestrial species within FKNMS would be **insignificant** or **discountable** given that noise from recreational or operational activity would be of limited duration, disturbed individuals could move to adequate suitable habitat nearby, and public outreach efforts would help minimize any negative effects from public use. The proposed action would also result in **beneficial** impacts because human activity would be restricted within portions of the sanctuary, particularly those areas known to be used by these listed species.

Changes to water quality

The proposed action could result in both adverse and beneficial impacts to water quality. Vessel operations could result in minimal adverse impacts to water quality due to the small potential for a localized decline in water quality if gas, fuel, or other contaminants leak or spill during derelict vessel collection or from unintended fuel, lubricant, sewage, or garbage spills from sanctuary vessels. Adherence to ONMS best management practices and NOAA Small Boat Program guidance would minimize impacts. Therefore, any adverse impacts to listed species from water quality degradation would be **discountable** given the low potential for a localized decline in water quality and the implementation of best management practices.

The proposed action would also result in beneficial impact from water quality and habitat improvements. The sanctuary’s management activities include removal of derelict vessels that may be leaking and

enforcement of current regulations that restrict certain discharges in the sanctuary. In addition, alternatives 2, 3, and 4 would update regulations, such as the restrictions on cruise ship discharges and new derelict vessel regulations, to further minimize the potential for pollutants to enter the sanctuary. Therefore, the proposed action would have a **beneficial** impact on listed terrestrial resources.

Protection of wetland and mangrove habitats

The principal threat to the survival and recovery of many listed terrestrial species is the loss, fragmentation, alteration, and degradation of its wetland habitat (USFWS 2017). In addition, runoff from phosphorus and nitrogen from agricultural and urban sources has degraded water quality within wetland habitats by altering the composition and structure of wetland plant communities used by listed species. These threats have resulted in reduced foraging and nesting opportunities for the listed species (USFWS 2017). Similarly, USFWS (2007) determined that a key to the recovery of wetland habitat in South Florida is the Comprehensive Everglades Restoration Plan, is implemented adjacent to FKNMS. The primary goal of these projects is to restore and protect wetland habitat.

Wetland and mangrove habitats would continue to be protected under the no action alternative, and additional habitat would be protected under alternatives 2, 3, and 4, which are listed in order of increasing protection. For example, certain activities that could fragment or degrade wetland habitat would be restricted and the permitting process would help to ensure that the impacts from any activities that could harm sanctuary resources would be minimized. In addition, habitat disturbances from recreational use would be minimized because many management plan activities involve educating the public about and promoting the responsible use of sanctuary resources (see Section 3.5). These public outreach and educational activities would help ensure that the public is aware of the need to avoid or minimize impacts to habitat for listed species. Therefore, the proposed action would have a **beneficial** impact on listed species by protected habitat used by listed species.

Impacts to ESA-listed marine mammals and reptiles under USFWS jurisdiction

In Section 4.2.3.1, NOAA determined that the West Indian manatee (*Trichechus manatus*), American crocodile (*Crocodylus acutus*), hawksbill sea turtle (*Eretmochelys imbricata*), leatherback sea turtle (*Dermochelys coriacea*), and loggerhead sea turtle (*Caretta caretta*) may occur within the action area. Potential adverse impacts to these species include human disturbances from recreational and sanctuary management activities and potential degradation of water quality. Potential beneficial impacts include the protection of foraging, wetland, and mangrove habitats, and potential improvements in water quality.

Impacts to marine mammal and reptile species under USFWS's jurisdiction would be similar to the impacts described above for the impacts to marine mammals and sea turtles described within Section 5.2.2.1.2. As described above, these impacts would be **insignificant, discountable, or beneficial** based on the following:

1. Vessel collisions and entanglement is highly unlikely due to NOAA's implementation of best management practices and the relatively low level of vessel and research activity that would occur within the sanctuary.
2. Noise and disturbances from recreational or operational activity would be of limited duration, human activity would be restricted within several portions of the sanctuary, and management activities and outreach efforts would help to reduce or avoid disturbances.

3. The proposed action would result in beneficial impacts because marine habitats would continue to be protected under the no action alternative, and additional habitat would be protected under alternatives 2, 3, and 4, which are listed in order of increasing habitat protection.

Impacts to ESA-listed plants under USFWS jurisdiction

As described in Chapter 4 and Appendix E, the 21 listed plants and one fern listed under USFWS jurisdiction are all terrestrial. The proposed action would have **no effect** on these species because FKNMS is limited to marine and estuarine waters.

Impacts to designated critical habitat under USFWS jurisdiction

As described in Section 4.2.3.1, the action area includes designated critical habitats under USFWS jurisdiction for the following species: American crocodile (*Crocodylus acutus*), Bartram's hairstreak butterfly (*Strymon acis bartrami*), Cape Sable thoroughwort (*Chromolaena frustrata*), Florida leafwing butterfly (*Anaea troglodyta floridalis*), Florida semaphore cactus (*Consolea corallicola*), loggerhead sea turtle (*Caretta caretta*), piping plover (*Charadrius melodus*), silver rice rat (*Oryzomys palustris natator*), and West Indian manatee (*Trichechus manatus*). As discussed above, designated critical habitat for insects, plants, and rats are not within the normal regulated area for FKNMS and the proposed action would not result in any direct disturbances or impacts to designated critical habitat for these species.

For the crocodile, sea turtle, and piping plover, potential adverse impacts would include minor disturbances from research or educational activities that may include walking through designated critical habitat, or from any recreational activities that occur near designated critical habitat. For these activities, negligible impacts may include soil compaction, trampling vegetation, or increased sedimentation from snorkeling, diving, or boating activities that stir up sediments. Impacts would be negligible because recreational activity would be of limited duration, human activity would be restricted within several portions of the sanctuary, and management activities and outreach efforts would help to educate the public and researchers about reducing or avoiding disturbances. Regulatory changes to add new sanctuary water quality protections and vessel speed and access restrictions would result in direct protection for seagrass foraging habitat and nesting beaches through updated regulations and marine zones. Additionally, as described above, shoreline and marine habitats would continue to be protected under the no action alternative, and additional habitat would be protected under alternatives 2, 3, and 4, which are listed in order of increasing habitat protection. In addition, public outreach and educational activities would help ensure that the public is aware of the need to avoid or minimize impacts to designated critical habitat. Therefore, the proposed action **would not adversely modify** designated critical habitat within the action area.

Conclusion for ESA-listed species and designated critical habitat under USFWS jurisdiction

NOAA determined that 30 federally listed species under the jurisdiction of USFWS may occur within the action area and that any impacts on these species from the proposed action would be beneficial, insignificant, or discountable for the following reasons:

1. Vessel collision, and entanglement is highly unlikely due to NOAA's implementation of best management practices and the relatively low level of vessel activity that would occur within the sanctuary.

2. Noise and disturbances from recreational or operational activity would be of limited duration, human activity would be restricted within several portions of the sanctuary, and management activities and outreach would help to reduce disturbance.
3. The proposed action would result in beneficial impacts because marine and wetland habitats would continue to be protected under the no action alternative, and additional habitat would be protected under alternatives 2, 3, and 4, which are listed in order of increasing habitat protection.

Based on the above information, NOAA finds that the proposed action **may affect, but is not likely to adversely affect** 30 ESA-listed species under USFWS jurisdiction (see Appendix E for full list). In addition, the proposed action **would not adversely modify** designated critical habitat under USFWS jurisdiction.

5.2.2.1.3 Cumulative impacts to ESA-listed species

The Endangered Species Act regulations at 50 CFR § 402.12(f)(4) note that federal agencies may want to consider cumulative effects as part of the effects analysis for the proposed action if the federal agency is developing a biological assessment to conduct formal Section 7 consultation. Under the Endangered Species Act, cumulative effects are defined as “those effects of future State or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation” (50 CFR § 402.02, “Definitions”). Unlike the National Environmental Policy Act (NEPA) definition of cumulative impacts (see Section 5.4), cumulative effects under the Endangered Species Act do not include past actions or other federal actions requiring separate Endangered Species Act Section 7 consultation. For the proposed action, NOAA determined that formal Section 7 consultation is not required because the proposed action **may affect but is not likely to adversely affect** any ESA-listed species. As such, NOAA did not consider the cumulative impacts of the proposed action to the ESA-listed species under the Endangered Species Act, but did consider cumulative impacts of the proposed action under NEPA. See Section 5.8 for the cumulative impacts analysis under NEPA.

5.2.2.2 Essential Fish Habitat

As noted in Section 4.2.3.3, EFH for 38 species or species complexes and life stages occurs within FKNMS. EFH is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” NOAA analyzed the potential impacts to EFH within the context of the MSA regulatory framework, including MSA-specific determinations regarding the potential impacts to EFH. Specifically, an EFH assessment under MSA must include a determination of either “adverse impact” or “no adverse impact” to EFH. Adverse effect is any impact that reduces the quality and/or quantity of Essential Fish Habitat. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH.

ONMS analyzed the impacts of managing and operating FKNMS on EFH within its draft PEA (NOAA 2018b). In consultation with NMFS for the draft PEA, NMFS concurred with NOAA/ONMS’s conclusion that field operations to manage FKNMS would not result in adverse impacts to EFH. (See the supporting material for this DEIS at www.floridakeys.noaa.gov/blueprint). However, NMFS stated that ONMS should consider whether future actions that include coral or seagrass restoration or non-emergency grounded vessel removal could adversely affect EFH on a case-by-case basis. As part of the

proposed action, FKNMS proposes to conduct coral restoration, non-emergency removal of grounded vessels, and an expanded mooring buoy program. The mooring buoy program would be expanded beyond that analyzed in the EFH Assessment associated with the draft PEA. No other changes to the management plan or regulatory updates would result in activities that would adversely impact EFH. Below is an assessment of the potential impacts to EFH from the expanded buoy program, non-emergency grounded vessel removal, and restoration activities.

5.2.2.2.1 Impacts to EFH under NMFS jurisdiction

Mooring buoy regulations

The installation of mooring buoys could cause permanent disturbance to benthic habitats. However, it would be an extremely limited area (less than approximately 10 square feet), and locations would be selected to place buoy anchors on bare bottom substrate to limit possible adverse disturbances. Potential negligible adverse impacts could result from installation of more substantial mounting hardware for buoys intended for large vessels which may cause additional damage to habitat. FKNMS provides access to mooring buoys, which wherever provided, may result in negligible damage to EFH in specific areas by attracting more users to these areas, particularly the numbers that may result from facilitating use by larger vessels. During the installation of anchoring equipment for mooring buoys, there could be minimal effects to benthic habitat because equipment could crush or block water access to habitat-forming benthic organisms (e.g., coral species). The long-term effects from the permanent placement of mooring buoys may adversely affect sessile surface or subsurface organisms, which provide habitat that support EFH species such as corals, by preventing settlement and growth of organisms in areas where sand or other substrates are covered by mooring anchors or associated equipment. However, the affected area on the bottom is very small (less than approximately 10 square feet), allowing habitat-supporting organisms to colonize adjacent substrate. ONMS would determine the buoy location to minimize impacts, such as avoiding EFH. Therefore, the proposed action would result in minimal adverse effects from the installation of long-term buoys and moorings because impacts would be minimized by the best management practices described above and any increase in water turbidity during the installation process would be localized and temporary.

Vessel groundings and deserted vessel regulations

Grounded vessel removal may have a temporary adverse impact on a small area of EFH because there is the potential for chemical seepage and habitat disturbance during the removal and, if needed, remediation processes. Derelict or deserted vessels can release toxic paint, chemicals, and petroleum products among other contaminants from the vessel and matter left aboard the vessel. If disturbed or deteriorating, they can disturb the surrounding benthic habitats, potentially creating plumes of sediment. During vessel removal activities, disturbance to habitat would be minimized so that plumes would be limited in size and dissipate quickly, therefore not resulting in adverse impacts to EFH. If species associated with EFH were intolerant to the temporary decline in water quality, mobile organisms such as fish could swim to nearby waters that would not be affected by a localized decline in water quality. Any areas with temporarily diminished water quality would likely recover quickly so that nearby habitat and any associated EFH species would not be affected. NOAA would work with the towing and salvage industry to develop a suite of guidelines and best management practices, incorporating relevant USCG regulations and best management practices and apply the current sanctuary general permit to certain towing and salvage operations. Therefore, the proposed action would result in minimal adverse effects based on the slight

temporary increase in turbidity that could occur during removal activities. The best management practices developed for certain towing and salvage operations would reduce or avoid any such impacts.

Coral and seagrass restoration

Coral and seagrass restoration activities could cause a temporary disturbance to a limited area of Essential Fish Habitat. Equipment, vessels, and divers may cause minor disturbance to EFH during restoration activities by deploying instrumentation used to monitor restoration efforts or by harvesting material either to remove invasive species or for transplantation to another restoration site. Additionally, restoration activities could cause temporary resuspension of sediments into the water column from vessels or other *in situ* activities. Any temporary decline in water quality caused by increased turbidity at a restoration site would be localized, and fish associated with EFH could swim to less turbid waters. When conducting coral and seagrass restoration activities, if these activities occurred within EFH, NOAA would follow best management practices such as anchoring in sandy substrate and deploying instrumentation slowly with constant supervision to minimize any potential loss or disturbance to EFH. Therefore, the proposed action would result in minimal adverse effects that would be limited spatially and temporally. Potential beneficial impacts associated with these proposed activities include marine zone regulations that would protect EFH associated with coral nurseries from anchor damage and potential impacts from fishing gear while also allowing the public to access and learn about coral restoration efforts. Additional activities to facilitate restoration of coral nursery sites are included in the proposed management plan (see Section 3.5).

5.2.2.2 Conclusion for Essential Fish Habitat

Based on the above analysis, impacts to designated EFH would be **beneficial or result in minimal adverse impacts** based on the following:

1. The limited number of activities that would result in direct habitat degradation, disturbance, or loss;
2. Any degradation in water quality would be localized, temporary, and dissipate quickly; and
3. Best management practices would limit the likelihood of accidental spills or releases within the sanctuary.

5.2.2.3 Migratory birds

USFWS has jurisdiction over those birds that are protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act as listed in Appendix E. These birds may be found transiting through the sanctuary and resting or foraging within the action area.

The primary potential impact to migratory birds would occur from human disturbances, which would be limited to vessel traffic and noise from recreational activities, removal of marine debris, or vessel traffic to support operations of the sanctuary, such as research or educational activities. Noise from these activities could disturb or displace migratory birds within an audible range of the sanctuary. If noise levels were audible enough to disturb migratory birds, adequate similar habitat could be found nearby in other portions of the sanctuary that would be beyond the audible range of sanctuary activities. In addition, noise and recreational activity levels during the next five to 10 years are expected to remain similar to current levels. Therefore, migratory birds within active portions of the sanctuary are likely familiar with

the current levels of recreational and operational activities within FKNMS and future human activity is unlikely to cause listed terrestrial species to avoid or abandon habitat within the action area.

Human disturbances would be minimized because many portions of FKNMS restrict human activity within several areas of the sanctuary that provide important habitat for listed species. This level of protection would increase if the sanctuary is expanded and new regulations are implemented. For example, current and proposed revisions to include the new no motor, no entry, and shoreline slow speed marine zones would limit noise and disturbance from human activities. Restricting these activities within certain portions of the sanctuary would result in beneficial impacts. In addition, disturbances from recreational use would be minimized because many management plan activities (see Section 3.5) involve educating the public about and promoting the responsible use of sanctuary resources. These public outreach and educational activities would help ensure that the public is aware of the need to avoid or minimize disturbing listed species.

In summary, the proposed action **would not result in a take** of a migratory bird given that noise from recreational or operational activities would be of limited duration, disturbed individuals could move to adequate suitable habitat nearby, and public outreach efforts would help minimize any negative effects from public use. The proposed action would also result in **beneficial** impacts because human activity would be restricted within portions of the sanctuary.

5.3 Impacts specific to Alternative 1: No action (status quo)

Under the no action alternative (Alternative 1), FKNMS would continue to manage the sanctuary under the current 1996 management plan/environmental impact statement, augmented in 2000 with the Tortugas Ecological Reserve supplemental environmental impact statement, the 2007 revised management plan, and FKNMS regulations codified at 15 CFR Part 922, Subpart P. No new regulations would be proposed, and the sanctuary and marine zone boundaries would remain the same. This section describes the beneficial and adverse impacts of continued management of FKNMS under Alternative 1.

The no action alternative does not fulfill the purpose and need of the proposed action (see sections 2.2 and 2.3). The no action alternative would not provide the beneficial effects associated with updating the sanctuary boundaries, regulations, zoning, and management plan to include:

- addressing the exacerbated long-term threats to sanctuary resources from local and regional sources,
- incorporating improved scientific data on the status and trends of the health of environmental resources within the sanctuary, and
- increasing public involvement in marine resource protection.

5.3.1 Impacts to biological and physical resources (Alternative 1)

Under the no action alternative, the sanctuary boundary and regulations would not change. FKNMS currently encompasses 3,800 square miles (9,842 square km). Sanctuary-wide regulations would remain as currently codified in 15 CFR Part 922, Subpart P. Similarly, the number, configuration, boundaries, location, and regulations of marine zones within the sanctuary would not change and the current management plan would remain in place.

Beneficial impacts: The beneficial impacts from managing the current boundaries of the sanctuary would continue. For example, sanctuary resources would continue to be managed under the current management plan and regulations; research efforts would provide managers with information to inform decisions related to resource protection activities; the public would become more educated about sanctuary resources; important habitat and wildlife would continue to be protected and managed; and damaged resources would be restored. As described in the draft PEA and summarized in Table 5.2, these **beneficial** impacts to biological and physical resources would be **direct** and **less than significant** (NOAA 2018b, <https://sanctuaries.noaa.gov/management/environmental-compliance/>).

Adverse impacts: The no action alternative would forego additional protections from the proposed boundary expansion. This forgone benefit would be most significant for the benthic habitats in the Tortugas region and the proposed ATBA due to the high quality habitat that they provide for a variety of fish, marine mammals, and sea turtles. Specifically, the no action alternative would not provide the additional water quality protection from the current sanctuary-wide prohibition on discharge because the boundary would not be expanded. The no action alternative would also forego additional sanctuary protections to the Pulley Ridge unit, which includes unique mesophotic coral reef ecosystems found there. This missed opportunity to strengthen the protection of these high-quality, important habitats would risk degrading the beneficial connectivity of these ecosystems to the Florida Keys and the ability of these reef systems to serve as a biological source for the Florida Keys in light of changing conditions.

Taking no action would forego the opportunity to update FKNMS's regulations to account for the increasing vessel traffic and use of sanctuary resources. For example, sanctuary-wide regulations on vessel discharge, fish feeding, vessel grounding, use of mooring buoys, and emergency regulations would not be updated or established, and therefore negative impacts to the biological environment from these activities would continue. Negative consequences such as pollution to coral reefs from cruise ship discharges; altered fish behavior from feeding activities; and damage to coral, sponges, and seagrass from vessel groundings and misuse of mooring buoys would continue to degrade biological resources in the sanctuary. These adverse impacts to biological and physical resources from continued management of FKNMS under the current boundaries, sanctuary-wide regulations, and management plan would be **direct** and **less than significant**.

Under the no action alternative, the number, configuration, boundaries, location, and regulations of marine zones within the sanctuary would not change. Therefore, the no action alternative would not provide necessary additional protections for deep reef, patch reef, hardbottom, seagrass, and mangrove habitats. Habitats that support sea turtle nesting and foraging; bird nesting, roosting, and foraging; and other habitats used by fish and invertebrates would not have additional protections. There would be no additional protections for areas with known or historical ESA-listed coral and associated critical habitat. There would be no additional protection of areas known to support fish spawning aggregations and/or the areas where fish transit for spawning. The no action alternative would also forego application of several more restrictive regulations aimed at addressing declines in habitat condition from vessel prop-scarring and anchor damage, among others, and wildlife disturbance from vessel proximity and noise. There would be no changes to baitfish permitting and catch and release fishing by trolling regulations in SPAs, which could potentially result in a decline of fish abundance and diversity as well as continued reduction of prey species for predatory fish and seabirds. These adverse impacts to biological and physical resources from continued management of FKNMS marine zones under current regulations would be **direct** and **less than significant**.

The management plan would not be updated under the no action alternative. As a result, the management plan would not provide further management clarity and direction for FKNMS, management and research partners, or those seeking to do research and education/outreach work in the sanctuary, among others.

5.3.2 Impacts to cultural and historical resources (Alternative 1)

Under the no action alternative, current FKNMS regulations and permitting categories would continue to guide management decisions related to cultural and historical resources in the sanctuary.

Beneficial impacts: The no action alternative would maintain the sanctuary regulations that apply to cultural and historical resources within the current boundaries of FKNMS. Cultural and historical resources benefit from these regulations particularly in federal waters of FKNMS through protection from looting and other physical disturbance. Beneficial impacts to cultural and historical resources under the no action alternative would be **indirect** and **less than significant**.

Adverse impacts: The no action alternative would not provide necessary additional protections for any cultural and historical resources that may be found in the proposed boundary expansion area or in the updated and proposed new marine zones. The no action alternative would not provide the enhanced protection of cultural and historical resources that would result from better coordination and alignment with Florida Division of Historical Resources permitting regulations and better alignment with the Federal Archaeological Program. In addition, under the no action alternative, NOAA would be less likely to assess known cultural and historical resources located outside the existing sanctuary boundary. Likewise, NOAA's ability to improve the public's understanding of cultural and historical resources in the Florida Keys beyond the current sanctuary boundary would be limited.

With the exception of U.S. and foreign sunken military craft protected under the Sunken Military Craft Act, most cultural and historical resources located beyond the sanctuary's existing boundary in U.S. federal waters lack protection from activities that can harm or destroy cultural and historical resources. The result of the no action alternative would be that these nonrenewable cultural and historical resources located beyond the existing sanctuary boundary would be more likely to be damaged or disturbed without commensurate information being generated for the American public. The potential adverse impacts to these nonrenewable cultural and historical resources under the no action alternative would be **indirect** and **significant**.

5.3.3 Impacts to socioeconomic resources and human uses (Alternative 1)

Under the no action alternative, the sanctuary boundary and regulations would not change. Similarly, the number, configuration, boundaries, location, and regulations of marine zones within the sanctuary would not change and the current management plan would remain in place. This section describes the impacts to socioeconomic resources and human uses that would occur under the no action alternative.

Beneficial impacts: The beneficial impacts of the no action alternative would include the avoided costs of adopting the proposed regulatory alternatives and the continued economic benefits of managing the sanctuary within its current boundaries, regulations, marine zones, and management plan. For example, in 2007-2008, the Monroe County recreation-tourism industry included \$2.1 billion in visitor and resident spending, which generated \$2.36 billion in sales/output, \$1.02 billion in income, and 33,622 full- and

part-time jobs in Monroe County. During this time period, recreation-tourism accounted for 63.3 percent of the total of Monroe County's economy sales/output (Leeworthy 2010, Leeworthy and Ehler 2010). For the 2009-2013 timeframe, the annual average value of commercial fishery landings in 2018 dollars was \$58.8 million, which generated \$85.8 million in sales/output, \$53.2 million in income and, 1,265 full- and part-time jobs (Leeworthy et al. 2019). These beneficial impacts to socioeconomic resources and human uses from the no action alternative would be **direct** and **less than significant**.

Adverse impacts: The adverse impacts to socioeconomic resources and human uses under the no action alternative would be the opportunity costs of not adopting more protective alternatives. Additional protection of resources within the current and proposed expanded sanctuary could increase the level and quality of ecosystem services (how humans benefit from the environment). Implementing the no action alternative would not realize the associated benefits for ecosystem services, commercial fisheries, recreational activities including fishing, snorkeling, scuba, eco-tourism, and other passive nonuse values that are associated with the more protective alternatives. These adverse impacts to socioeconomic resources and human resources would be **indirect** and **less than significant**.

5.4 Impacts specific to Alternative 2

This section describes the beneficial and adverse impacts from (1) boundary expansion, (2) updated and new sanctuary-wide regulations, (3) marine zone boundary and regulatory changes, and (4) an updated management plan. Under Alternative 2, NOAA would implement the following:

Sanctuary boundary expansion to include:

- The area to be avoided (ATBA).
- The area in the Tortugas region between the existing sanctuary boundary and the Tortugas South Ecological Reserve.

Updated and new sanctuary-wide regulations to include:

- Three proposed updates to the following existing sanctuary-wide regulations:
 1. prohibiting certain discharges by cruise ships;
 2. increasing the time frame for emergency regulation application; and
 3. updating the historical resources permit categories.
- Four proposed new sanctuary-wide regulations, including:
 1. prohibiting fish feeding;
 2. prohibiting actions related to derelict or deserted vessels;
 3. prohibiting leaving harmful matter aboard derelict or deserted vessels; and
 4. restrictions on the use of smaller mooring buoys by large vessels and overnight use of mooring buoys.
- Several minor or technical revisions and updates to regulatory definitions, terms, and provisions. Since these changes would be limited primarily to administrative changes and minor clarifications, the proposed updates would not result in direct, indirect, or cumulative impacts on any sanctuary resources in the existing sanctuary or proposed expansion area. See a discussion of these changes in Appendix B.

Marine zone boundary and regulatory changes to include:

- Expanding the total number of different zones from 57 areas to 96.
- Implementing new and revised marine zone regulations within four zones, including:
 1. Wildlife management areas (WMAs);
 2. Sanctuary preservation areas (SPAs);
 3. Conservation areas; and
 4. Management areas.
- Updating two zoning regulations, including:
 1. Eliminating fishing for baitfish in all SPAs and eliminating catch and release fishing in four SPAs (as described in Section 3.4.3); and
 2. Revising motorized watercraft restrictions within Key West National Wildlife Refuge (as described in Section 3.4).

Updated management plan to include:

- The non-regulatory actions that NOAA intends to implement to further protect and manage sanctuary resources. (For the draft management plan text, see Section 3.5.)

Alternative 2 aims for greater overall protection than the no action alternative. This is primarily achieved through expanding the sanctuary boundary, revising current and adding new sanctuary-wide regulations that are more protective of sanctuary resources, changing the number and configuration of marine zones and the access restrictions/regulations proposed for the marine zones, and revising the FKNMS management plan.

Impacts from Alternative 2 would include the impacts common to all alternatives (see Section 5.2) in addition to the impacts specific to Alternative 2, which are described below.

5.4.1 Impacts to biological resources (Alternative 2)

This section describes the specific impacts to fish, birds, turtles, marine mammals, and wildlife that would occur under Alternative 2.

5.4.1.1 Impacts to biological resources from proposed sanctuary boundary expansion (Alternative 2)

Under Alternative 2, NOAA would expand the boundary of FKNMS to encompass the area currently regulated as the area to be avoided (ATBA) along the northeast to southeast boundary in the Upper Keys region and the area within the Tortugas region to encompass Tortugas South and capture additional ecological features known to support fish aggregation activity and to the west of the Tortugas Ecological Reserve North unit to encompass additional areas of the Tortugas Bank.

Beneficial impacts: Expanding the sanctuary boundary would provide additional protections for biological resources because FKNMS would implement existing and proposed new or modified sanctuary regulations in the expanded area, as described in Section 3.2. Within the Tortugas region, beneficial impacts would be **direct** and **significant** due to the biological importance of the region, which includes a high diversity and abundance of coral and other hardbottom species, high fish biomass and abundance, and spawning grounds for multiple fish species. Specific proposed regulatory changes that would result in beneficial impacts within the proposed expansion area would include: (1) prohibiting alteration of or construction on the seabed; (2) prohibiting certain vessel operations that could strike or injure coral,

seagrass, or other immobile organisms attached to the seabed or that could collide with marine mammals or other biota; and (3) restricting anchoring on live coral.

Sessile, motile, and interstitial species (e.g., coral, sponge, lobster, and conch) that make their home within the benthic habitats and sediment would benefit from this prohibition because of avoided adverse impacts associated with injury or habitat disturbance or destruction. Implementing a prohibition on drilling into, dredging, prop dredging, or placing/abandoning any matter on the seafloor would also help to avoid adverse impacts to hardbottom and coral reef habitats in the proposed expansion areas. Restricting anchoring on live coral would have **direct beneficial** impacts to coral habitat resources in the expansion areas.

Biological resources within the proposed expansion area would experience **significant direct beneficial impacts** due to the protections provided by inclusion within the boundary of a national marine sanctuary. In addition to these current sanctuary regulations, biological resources in the current sanctuary and proposed expansion area would be protected by the proposed sanctuary wide-regulatory changes, which are discussed below in Section 5.4.1.2.

Adverse impacts: Expansion of the sanctuary boundary would spread the adverse impacts of current field operations on biological resources (summarized in Table 5.2) over a larger geographic area. As described in Table 5.2, these adverse impacts to biological resources would be **direct** and **less than significant**. Consistent with the analysis in the draft PEA, ONMS expects that these **adverse** effects of field operations would be less than significant because the activities would be short-term and localized, and FKNMS would employ a variety of best management practices to avoid or minimize impacts to the natural and human environment (NOAA 2018b). In addition to these current sanctuary regulations, any additional impacts to biological resources in the current sanctuary and proposed expansion area from proposed sanctuary wide-regulatory changes, changes to marine zones and related regulations, and the revised management plan are discussed below in sections 5.4.1.2 through 5.4.1.4. Overall, the significant benefits to biological resources would outweigh the negligible and less than significant adverse impacts from expanding the site boundary.

5.4.1.2 Impacts to biological resources from additions and revisions to sanctuary-wide regulations (Alternative 2)

Under Alternative 2, ONMS would update or modify the sanctuary-wide regulations to include (1) prohibiting certain discharges by cruise ships; (2) increasing the time frame for emergency regulation application; (3) updating the historical resources permit categories; (4) prohibiting fish feeding; (5) prohibiting actions related to derelict or deserted vessels and leaving harmful matter aboard such vessels; and (6) restricting the use of smaller mooring buoys by large vessels and the overnight use of mooring buoys. The potential beneficial and adverse impacts to biological resources of each of these proposed updates or modifications are discussed below.

Proposed sanctuary-wide regulation update: Prohibit certain cruise ship discharges

Beneficial impacts: The application of the proposed regulation prohibiting certain discharges from cruise ships would benefit habitats and wildlife in the vicinity of cruise ship transit lanes within the sanctuary by preventing contact with pollutants such as bacteria, pathogens, oil and grease, detergent and soap residue, metals (e.g., cadmium, chromium, lead, copper, zinc, silver, nickel, and mercury), solids, acidic water,

and nutrients (USEPA 2008b, USEPA 2010). Many of these waste products are directly harmful to filtering organisms found in the sanctuary, such as sponges and corals, which may ingest them. In addition, heavy metals can bioaccumulate and decrease the overall health of many aquatic biota, especially larger predators. A reduction in the pollutants and improvements to habitat quality would result in **direct, less than significant beneficial** impacts.

The proposed discharge regulation may also cause **indirect beneficial** effects by reducing waste nutrients in the sanctuary which promote algal blooms that shade photosynthesizing corals and lower oxygen levels as they are degraded by bacteria, affecting a wide range of marine life.

Adverse impacts: This proposed regulatory update would result in increased protection of water quality and would not increase the amount of boat traffic or other activities that could result in adverse impacts associated with cruise operations. **No adverse impacts** to biological resources would be expected from the implementation of this regulatory change.

Proposed sanctuary-wide regulation update: Extend time period for emergency regulations

Beneficial impacts: The proposed modification to the existing emergency regulation would extend the amount of time that an emergency regulation can be in place for FKNMS to respond to emergencies occurring within the sanctuary that threaten biological resources. This proposed regulatory change would have a **direct beneficial** impact on habitats and wildlife within the sanctuary because it would allow NOAA more time to take necessary remedial action or to conduct restoration activities to avoid or prevent impacts to biological resources. With an extended 180-day time frame (and potential for a 186-day extension) for an emergency regulation, NOAA would have more time to better evaluate conditions of sanctuary resources to determine if longer-term management action would be needed to address the resource issue, thus enhancing resource management decisions. The **significance** of these beneficial impacts would depend on the threat to sanctuary resources that the management action addresses. See Section 3.2.4 for examples of how the emergency regulation has been applied in the past.

Adverse impacts: ONMS finds that extension of the time frame that an emergency regulation can be in place would further resource protection within the sanctuary and is unlikely to result in any adverse impacts to biological species or habitat. All emergency response activities would be conducted in a manner that is consistent with sanctuary regulations and other environmental statutes in order to protect biological resources. Any adverse impacts to biological resources associated with FKNMS-authorized vessel operations or other emergency response activities are described in Table 5.2. **No additional adverse impacts** to biological resources are expected from the proposed modification to the emergency regulations beyond those already described for currently existing field operations and management of the sanctuary in Section 5.2.1.

Proposed sanctuary-wide regulation update: Historical resources permit categories

Beneficial impacts: Some historical resources function in the marine environment as structures that provide valuable three-dimensional habitat for marine life. Disturbance of the historical resource not only jeopardizes its preservation, but also reduces its value as habitat for marine biota. Protecting this role is recognized in the new archaeological research permit category that would require proposals for archaeological research to be scientifically-based investigations that result in the least amount of disturbance to the historical resource needed to answer project research questions. Similarly, the new

archaeological research permit category would require that investigators provide a scientifically-justified rationale for excavations that disturb substrate or sediment while searching for or investigating historical resources. Constraining excavation activities conducted under an archaeological research permit to only those necessary to answer research questions would also protect water quality through impacts from turbidity caused by sediment disturbance. Given that the proposed regulation would protect sunken artifacts that provide habitat for marine biota and would reduce the possibility of increased turbidity associated with excavation of sunken historical artifacts, the proposed update would result in **less than significant beneficial impacts** to biological resources.

Adverse impacts: The proposed regulatory update would not increase the amount of research or other activities that could result in adverse impacts to biological resources. Therefore, **no additional adverse impacts** beyond the impacts applicable to all alternatives (see Section 5.2.1) would result from the proposed regulatory change.

Proposed new sanctuary-wide regulation: Prohibit fish feeding

Beneficial impacts: The proposed new regulation would clarify prohibitions specific to the practice of fish feeding and would reduce negative effects on wildlife behavior associated with fish feeding and habituation of some wildlife to areas where fish feeding is common. Fish that are often fed from boats or by divers begin anticipating such food and may alter or stop normal foraging patterns. In addition, the food offered from vessels or by divers is generally low quality and provides minimal nutrients to fish. Hand-fed fish may become malnourished, stressed, and even die. Fish feeding can also result in changes to fish community structure and dynamics because certain fish species tend to benefit more from human food than others. The proposed regulation would result in **direct and less than significant beneficial impacts** because these adverse outcomes would be avoided.

Adverse impacts: ONMS concluded that this proposed new regulation would not change human behavior or the type or intensity of activities occurring within the sanctuary in a manner that would result in adverse impacts to biological resources. **No adverse impacts** to biological resources are expected from the implementation of this new prohibition on fish feeding.

Proposed new sanctuary-wide regulation: Reduce impacts from vessel groundings, deserted vessels, and harmful matter

Beneficial impacts: The proposed new regulations related to derelict and deserted vessels and leaving harmful matter aboard such vessels would have both **direct and indirect significant beneficial impacts** on habitats and wildlife within the expanded sanctuary. These proposed regulations are intended to reduce the number of derelict and deserted vessels and the length of time they may be present in the sanctuary. This could result in avoided direct adverse impacts on habitats such as scouring of sediment; destroying, shading, and covering seagrass; and breaking hardbottom and coral. These adverse impacts can all be exacerbated if the vessel breaks apart, is moved great distances in storm events, or deteriorates. Other impacts harmful to the biological environment that may be reduced by the implementation of these new regulations would include the release of toxic paint, chemicals, petroleum products and other contaminants, and debris from both the vessel and matter left aboard the vessel. These disturbances can be locally **significant** and given the overall size of the sanctuary and number of derelict vessels that occur, can also be cumulatively **significant**. As vessel traffic continues to increase throughout the Florida Keys, the need to better regulate damage from these impacts, establish improved standards regarding damage

assessment procedures, and improve notice and response time increases as well. Prohibiting these activities and requiring notification and a removal plan could decrease and shorten the duration of potential impact from derelict and deserted vessels, resulting in an overall **direct, significant benefit** to biological resources within the sanctuary.

Adverse impacts: These proposed new regulations could result in **direct, less than significant, adverse** impacts to biological resources during derelict vessel removal due to the minimal potential for localized decline in water quality associated with accidental spills or leaks. Fuel, lubricant, sewage, garbage, or other contaminants could accidentally leak or spill from derelict vessels or sanctuary vessels during removal operations. Adherence to ONMS best management practices and the NOAA Small Boat Program's standard operating procedures would also minimize potential for adverse impacts.

Proposed new sanctuary-wide regulation: Clarify appropriate mooring buoy use

Beneficial impacts: Mooring buoys have been used successfully in the sanctuary to minimize the direct impacts of anchoring and the cumulative effects of overuse of sanctuary resources. When used, monitored, and managed properly, mooring buoys have **beneficial** impacts on wildlife and habitats by minimizing anchor damage and controlling resource use. Under Alternative 2, proposed mooring buoy regulations would implement vessel size limits at buoys in sensitive and/or high use areas, prohibit general overnight use of mooring buoys, and designate large vessel mooring buoys. These regulatory changes would have a **direct, beneficial, less than significant** impact on coral and hardbottom habitat in the areas where mooring buoys would be located by reducing physical damage from anchoring. The large buoy hardware used and installation process would be specifically designed to withstand the size and weight of larger vessels and would therefore have less likelihood of breaking and impacting benthic habitat in which the mooring hardware is embedded. The proposed vessel size limitation for use of mooring buoys would minimize damage to the coral reef and reef structure, result in healthier reefs, and facilitate reef restoration activities. The impact of prohibiting overnight use of mooring buoys would depend upon the activities overnight moored vessels are undertaking.

Adverse impacts: The adoption and implementation of proposed revised mooring buoy regulations would allow access to mooring buoys that, wherever provided, may result in **direct, adverse, less than significant** impacts to corals or hardbottom habitat. Localized habitat damage could occur where mooring buoys are installed because the buoys attract more users to these areas. In particular, the proposed regulation would facilitate the use of certain mooring buoys by larger vessels. Installation of substantial mounting hardware for large vessel buoys could result in localized disturbance of benthic habitats, immobile biota, and biota that are unable to move away from the area prior to the disturbance.

5.4.1.3 Impacts to biological resources from revisions to marine zone boundaries and regulations (Alternative 2)

Under Alternative 2, ONMS would modify existing marine zones and create new marine zones to provide additional protection for specific habitat types, habitat areas that are heavily impacted by human use, and wildlife associated with these habitats. The total number of marine zones would increase from 57 to 96. In addition, ONMS would revise regulations governing uses of individual marine zones. See Section 3.6 for details on the individual marine zones, and Section 3.3 for a summary of access restrictions in the marine zones.

The discussion of impacts below is divided into four marine zone types and two proposed regulatory changes: (1) wildlife management areas, (2) sanctuary preservation areas, (3) conservation areas, (4) management areas, (5) revision of baitfish and catch and release fishing prohibitions, (6) revision of motorized personal watercraft use restrictions.

As discussed in more detail below, the general benefits of modifying existing marine zones, establishing new marine zones, and updating regulations applied in these areas would be increased protection of vulnerable habitats and their associated species, including ESA-listed species, critical habitat, and Essential Fish Habitat. Species abundance, diversity, and distribution are intricately related to the habitats within the Florida Keys that those species depend on for their survival. Many species in the Florida Keys are vulnerable to changing habitat conditions, and their populations may be supported by protecting the various habitats that species use throughout their life.

Proposed marine zone modification: Wildlife management areas

There are 28 wildlife management areas (WMAs) in the current FKNMS. Under Alternative 2, ONMS would revise the boundaries of some existing WMAs and create 31 new WMAs. WMAs are primarily designed to protect shallow water and near shore habitats and the critical wildlife dependent upon those habitats, especially birds and ESA-listed threatened or endangered species (NOAA 1997). Each WMA would have zone-specific regulations designed to meet the resource protection needs of the zoned area.

In Alternative 2, ONMS would implement access restrictions in each WMA, including idle speed only/no-wake, no-motor, no-anchor, and a limited number of no-entry areas. In addition, ONMS would modify the existing no-access buffer zone and closed zone regulations to no-entry zone to be consistent with the intent of these existing regulations and similar state regulations. By modifying access restrictions, ONMS aims to reduce impacts to benthic habitats from prop scarring, anchor damage, and impacts to wildlife species, including interrupting foraging sea turtles and birds, and flushing nesting and roosting birds.

Beneficial impacts: Under Alternative 2, implementing the proposed modified and new WMAs would have **direct beneficial** impacts on the habitats included in the proposed WMAs as well as wildlife included within or associated with each WMA. The WMAs proposed under Alternative 2 would protect new habitat types, including hardbottom and shallow bank habitats. A sampling of the wildlife these marine zones aim to support includes: roosting, nesting and foraging birds; nesting and foraging sea turtles; and juvenile fish. Modifications to WMA zones and implementing new WMAs would also have an **indirect beneficial** impact on mangrove habitats by restricting access to certain zones that encircle or are adjacent to mangrove coastlines and/or islands. Additionally, implementing access restrictions in WMAs would provide **direct beneficial** impacts to biological resources by reducing overuse of sanctuary resources and limiting habitat degradation that can disrupt the community structure of an area. A selection of modified or new WMAs, proposed in Alternative 2, are described below to provide specific examples of the direct and indirect beneficial impacts to habitat and wildlife associated with implementing this alternative. Except where otherwise stated below, these beneficial impacts would be **less than significant**.

New Whitmore Bight WMA: Under Alternative 2, ONMS would implement a proposed new no-motor WMA at Whitmore Bight, which would have **direct beneficial** impacts on hardbottom habitat and associated invertebrate and juvenile fish species in this new WMA. This action would provide a new approach for protecting hardbottom habitat and associated fish in this WMA.

Expanding Snake Creek and Cotton Key WMAs and New Marathon Oceanside WMA: Under Alternative 2, ONMS would expand two existing no-motor WMAs, Snake Creek and Cotton Key, to include additional areas with known impacts to seagrass from prop-scarring. Including these areas in the WMAs would provide **direct beneficial** impacts to seagrass. For much the same reason, implementing the proposed new speed-restricted Marathon Oceanside Shoreline WMA under Alternative 2 would provide **direct beneficial** impacts to heavily prop-scar-impacted seagrass areas by minimizing the potential for further habitat disturbance or destruction.

New Gulfside Banks and Moser Channel WMAs: Under Alternative 2, ONMS would implement proposed new idle speed only/no-wake marine zones at Gulfside Banks and Moser Channel. This would provide **direct beneficial** impacts to shallow water seagrass and hardbottom habitats that support juvenile invertebrate and fish species.

New East and West Barracouta Key Flats WMAs: Under Alternative 2, ONMS would implement two proposed new no-anchor marine zones, East and West Barracouta Key Flats, which would provide **direct beneficial** impacts to shallow water foraging areas for birds and sea turtles. This would be a new approach to protecting these habitats that are important for sea turtles in the Florida Keys.

New WMAs in the Florida Keys Wildlife Refuge Complex: Under Alternative 2, ONMS would implement several proposed new no-motor zones in the Florida Keys Wildlife Refuge Complex that would provide **direct beneficial** impacts to bird species that use these areas for nesting, roosting, and/or foraging. These proposed zones would also have **direct beneficial** impacts on shallow water habitat and associated wildlife and mangroves, where the marine zone encompasses a mangrove island.

Within the Florida Keys Wildlife Refuge Complex, wading bird and seabird species forage during specific windows of the tidal cycle when prey species can be found at accessible water depths in seagrass and hardbottom habitats. Adopting the proposed modified and proposed new speed-restriction, no-motor, and no-entry marine zones in Alternative 2 would minimize disturbance to the most critical seagrass and hardbottom areas used for foraging and would provide a **significant direct beneficial** impact to numerous bird species who forage in these habitats. By minimizing disturbance, these proposed marine zones would provide a **significant direct beneficial** impact to over 13 species of state-threatened nesting and roosting birds on mangrove islands, intratidal, and beach berm habitats adjacent to the zones. Numerous research studies have documented the negative impacts of human disturbance on breeding bird colonies (Vos et al. 1985, Carney and Sydeman 1999). The use of 100-yard (300 feet/100 m) no-motor buffers around nesting colonies and roosting and foraging areas would alleviate many of these negative effects (Burger et al. 1995, Rodgers and Smith 1995, Rodgers and Smith 1997, Carney and Sydeman 1999).

New Western Dry Rocks WMA: Under Alternative 2, ONMS would implement a proposed new WMA at Western Dry Rocks, which would provide **direct beneficial** impacts to habitats and wildlife, particularly fish species, which use this area for spawning. The trolling-only regulation proposed at this site would facilitate these benefits.

New Marquesas Keys Turtle WMA: Under Alternative 2, ONMS would implement the proposed new speed-restricted Marquesas Keys Turtle WMA, which would provide **significant direct beneficial** impacts to seagrass habitats that are recognized as internationally important foraging areas for green sea turtles. Enacting speed restrictions would reduce adverse impacts to seagrass habitats and foraging areas by decreasing the risk of propeller-related damage.

Adverse impacts: The proposed new WMAs or modifications to existing WMAs and implementation of speed restrictions would expand protection of habitat and wildlife and include additional habitat types not currently well-represented in the FKNMS marine zones. This would reduce the risk of adverse impacts to biological resources from human use of these areas. ONMS does not anticipate that revising WMA boundaries or speed restrictions would result in adverse impacts to biological resources because the speed restrictions and boundary changes would not increase use of these areas or result in a higher risk of interactions between humans and sensitive wildlife or habitats. As such, **no adverse impacts** to biological resources are expected from the proposed modified or new WMAs.

Proposed marine zone modification: Sanctuary preservation areas

FKNMS currently includes 19 sanctuary preservation areas (SPAs), which are areas set aside to protect shallow coral reefs along the reef tract. Under Alternative 2, ONMS would revise the boundaries of some existing SPAs and create six new SPAs. SPAs are primarily designed to protect shallow, heavily-used coral reef communities where conflicts between user groups occur (NOAA 1997), particularly between fishing activities and diving/snorkeling activities. Due to the existing sanctuary-wide regulation prohibiting anchoring on live coral, the placement of mooring buoys to facilitate compliance with the anchoring prohibition, and the SPA-specific regulation prohibiting the take of marine species, SPAs also serve to protect the habitats within their zone boundaries. Under Alternative 2, ONMS would also revise SPA regulations to be consistent across all SPAs and add idle speed only/no-wake and no-anchor restrictions. Under Alternative 2, ONMS would implement two modifications related to fishing within SPAs: eliminate (1) the issuance of baitfish permits, and (2) the exception for catch and release fishing in four SPAs (Conch Reef, Alligator Reef, Sombrero Reef, and Sand Key). As described above, these proposed regulatory changes are designed to create more consistency in the allowed and restricted activities in SPAs. This change would also provide greater clarity for users of SPAs and enhance compliance with sanctuary regulations.

Beneficial impacts: In Alternative 2, ONMS would modify existing SPAs and propose new SPAs which would have a **direct beneficial** impact on habitats that are added to existing marine zones or are newly-protected through proposed new zones. This **direct** benefit would extend to wildlife that have a small home range and may remain within the zoned area for their full life cycle. This action could also have an **indirect beneficial** impact on more motile or pelagic species that have a larger home range than the area proposed for inclusion in the SPAs. Some of the proposed modified or new SPAs are designed to specifically include known fish aggregation sites, which would have a **direct beneficial** impact for those fish species. Under Alternative 2, ONMS would also propose specific SPAs that are targeted for ecosystem restoration, which would provide benefits to resources within these areas and to advancing research and understanding of restoration techniques.

The proposed modification to eliminate the issuance of baitfish permits would have a **negligible** impact on the target baitfish species because collecting baitfish is not restricted in the non-zoned areas of the sanctuary, and therefore collecting baitfish would continue in non-zoned areas. Reduced baitfish availability has been documented to impact numerous seabird and wading bird populations (Gawlik 2002, Cury et al. 2011, Sherley et al. 2015, Essington et al. 2015). Therefore, depending on shifting fishing effort and any potential decrease of baitfish extraction, the proposed regulation would have an **indirect beneficial** impact on baitfish-dependent birds and other species higher on the trophic chain (e.g.,

barracuda, dolphins, wading birds, and seabirds) that eat the baitfish species. This beneficial impact would be less than significant.

The proposed modification to remove the existing exception that currently allows catch and release fishing in four SPAs (Conch Reef, Alligator Reef, Sombrero Reef, and Sand Key) would have a **direct negligible** impact on the wildlife of the Florida Keys, specifically those pelagic fish species targeted for catch and release in these deeper reef areas. Similar to the impacts to baitfish species described above, this benefit would be negligible because catch and release fishing would continue unrestricted in the non-zoned areas of the sanctuary outside of SPAs.

These direct and indirect benefits to biological resources are expected to be **less than significant** because of the moderate increase in the size of the zones managed as SPAs. A selection of modified or new SPAs, proposed in Alternative 2, are described below to provide specific examples of the **direct beneficial** impacts to habitat and wildlife associated with implementing this alternative:

Expanding Carysfort Reef SPA; expanding Key Largo Dry Rocks and Grecian Rocks SPA: Under Alternative 2, ONMS would modify the existing Carysfort Reef SPA to include an area of deep reef habitat and a historical fish aggregation site, which would have a **direct beneficial** impact on these reef habitats and associated wildlife by expanding protections and regulations to these new areas. In addition, ONMS would combine and expand the existing Key Largo Dry Rocks and Grecian Rocks SPAs to include an area at North Dry Rocks that would protect an area containing one of the largest remaining healthy populations of ESA-listed star corals on outer reefs in the Upper Keys. This action to expand regulatory protections to these habitats would have a **direct beneficial** impact on these reef habitats and associated wildlife, particularly furthering the protection of threatened star corals present in these areas.

Expanding Alligator Reef SPA: Under Alternative 2, ONMS would expand the existing Alligator Reef SPA seaward to protect deeper reef habitats and to include a historical fish aggregation site. This action would have **direct beneficial** impact on these habitats and associated wildlife that would be newly-protected from human activities that could cause adverse impacts to reef habitats, such as anchor damage or impacts from fishing gear.

New Turtle Rocks SPA and new Turtle Shoals SPA: Under Alternative 2, ONMS would implement two new SPAs, Turtle Rocks and Turtle Shoals, in order to protect patch reef coral habitat, which are not well represented in the current marine zoning scheme. This action would have a **direct beneficial** impact on these reef habitats and associated wildlife by reducing or minimizing potential adverse impacts associated with human use of these sensitive areas. Additionally, ONMS would propose protections at Turtle Rocks that would enhance the no lobster trap gear regulations implemented at this site by John Pennekamp Coral Reef State Park.

Expanding Western Sambo SPA: Under Alternative 2, ONMS would include the existing Western Sambo Ecological Reserve as a SPA and continue to allow the current level of access to this area. In Alternative 2, ONMS would also expand Western Sambo seaward to include additional deep reef habitat known to be important for the spiny lobster life cycle (Bertelson 2013, 2009). This proposed expansion would provide **direct beneficial** impacts for these deeper reef habitats and associated wildlife by protecting important habitat for spiny lobster from adverse impacts of human use of this area, such as anchor damage and fishing gear.

New Tortugas Corridor SPA: Under Alternative 2, ONMS would implement a new SPA in the Tortugas Corridor in the Tortugas region. This area is known to serve as a transit corridor between Tortugas Ecological Reserve South and Dry Tortugas National Park for spawning fish. This proposed new zone would provide **direct beneficial** impacts by protecting the fish species transiting through this area from human disturbance.

New Pickles Reef, Marathon, Delta Shoals, and Key West SPAs: Under Alternative 2, ONMS would implement four new SPAs as coral restoration demonstration sites. These sites are Pickles Reef, Marathon, Delta Shoals, and Key West SPAs. These areas are currently active coral reef nursery and/or restoration sites. By creating marine zones at these sites and applying SPA regulations, the sanctuary would protect the nursery coral from anchor damage and potential impacts from fishing gear while also allowing the public to access and learn about coral restoration efforts. These proposed new zones would provide **direct beneficial** impacts to the habitats and coral nursery sites. Additional activities to facilitate ecosystem restoration for coral nursery sites are included in the proposed management plan (see Section 3.5 for more details).

Adverse impacts: The proposed new SPAs, modifications to existing SPAs, and implementation of restrictions on fishing gear use and vessel anchoring would expand the protection of habitat and wildlife and include additional habitat types not currently well represented in FKNMS marine zones. This would reduce the risk of adverse impacts to biological resources from human use of these areas. ONMS does not anticipate that revising SPA boundaries or implementing regulatory restrictions would result in adverse impacts to biological resources because these changes would not increase human use of these areas or result in a higher frequency of interactions between humans and sensitive wildlife or habitats. **No adverse impacts** to biological resources are expected from the proposed modified or new SPAs.

ONMS does not anticipate that eliminating baitfish permitting and revising regulatory restrictions on catch and release fishing in SPAs would result in adverse impacts to biological resources because these changes would not increase human use of the sanctuary or result in a higher frequency of interactions between humans and sensitive wildlife or habitats. Although some bait fishing that would have occurred within a SPA may now occur in other parts of the sanctuary, ONMS does not expect that this action would increase the intensity of bait fishing in other areas of the sanctuary where these restrictions are not in place at such a scale that it would cause adverse impacts to baitfish populations in the Florida Keys or other wildlife and habitats. **No adverse impacts** to biological resources are expected from the proposed regulatory changes in SPAs.

Proposed marine zone modification: Conservation areas

Under Alternative 2, ONMS would adopt conservation areas as a new marine zone type that would replace the existing special use area and ecological reserve zones. There are currently four special use areas and two ecological reserves in FKNMS. Under Alternative 2, ONMS would create eight conservation areas, which includes the existing four special use areas and two ecological reserves. FKNMS staff would continue to manage conservation areas consistent with the original intent of special use areas and ecological reserves. Special use areas were intended to address the need for education, science, restoration, monitoring, or research. Ecological reserves were designed to maintain a natural assemblage of living resources in the sanctuary by setting aside areas to ensure minimal human

disturbance (NOAA 1997). Under Alternative 2, the current transit-only regulation applicable in special use areas and ecological reserves would continue to apply in the new conservation areas.

Beneficial impacts: Under Alternative 2, applying the transit-only regulation in areas proposed as conservation areas would limit degradation of habitats and potential loss of wildlife in these zones. In addition, implementing conservation areas would have **direct beneficial** impacts on the habitats and wildlife included in the proposed marine zones. This action would expand regulatory protections restricting human use of these areas to additional habitat types not currently well represented in the FKNMS marine zones, specifically hardbottom, bank, and seagrass, providing **direct beneficial** impacts to these habitats and the species that depend on them. The impacts of proposed changes to conservation areas and access restrictions would be **less than significant** because of the moderate change in the area of marine zones protected as conservation areas. A selection of modified or new conservation areas, proposed in Alternative 2, are described below to provide specific examples of the **direct beneficial** impacts to habitat and wildlife associated with implementing this alternative:

New Channel Key Bank and Red Bay Bank conservation areas: Under Alternative 2, ONMS would propose two new conservation areas, Channel Key Bank and Red Bay Bank, to protect hardbottom and bank habitats, both of which are not well represented in the current zoning scheme. Managing these new areas as conservation areas would have a **direct beneficial** impact on the associated habitats and wildlife in this area by minimizing the interactions between human use and wildlife and facilitating continued research and restoration activities in these areas. These proposed conservation areas are associated with other new idle speed/no-wake WMAs, proposed in Alternative 2, that are intended to address impacts to benthic habitats and associated wildlife from vessel prop scarring (see the above wildlife management area section and Section 3.6 for more details).

Expanding Tennessee Reef Conservation Area: Under Alternative 2, ONMS would expand the Tennessee Reef Conservation Area (currently referred to as a special use area) to include deep reef habitats which are not well represented in the current zoning scheme. The expansion of this conservation area would have **direct beneficial** impacts on the habitats and wildlife that reside or forage in this area.

Expanding Tortugas South Conservation Area: Under Alternative 2, ONMS would expand the Tortugas South Conservation Area (currently referred to as an ecological reserve) to include an additional area to the west of the existing boundary that includes ecological features associated with Riley's Hump and is known to support multi-species fish spawning aggregations. This proposed modification would have a **direct beneficial** impact on the associated habitats and wildlife using this area through the additional spatial protections and applications of conservation area regulations.

Adverse impacts: The management and implementation of conservation areas as proposed in Alternative 2 would expand the areas within the Florida Keys that are afforded protection from human disturbance and set aside for monitoring, research, restoration, or education. This would reduce the risk of adverse impacts to biological resources from human use of these areas. ONMS does not anticipate that creating conservation areas and applying current regulatory restrictions to these new areas would result in adverse impacts to biological resources because these changes would not increase human use of these areas or result in a higher frequency of interactions between humans and sensitive wildlife or habitats. **No adverse impacts** to biological resources are expected from the proposed modified or new areas included as conservation areas.

Proposed marine zone modification: Existing management areas

Existing management areas are those marine zones that were already in place at the time FKNMS was designated. These zones include what at the time of designation were the Key Largo and Looe Key National Marine Sanctuaries and the four national wildlife refuges that make up the Florida National Wildlife Refuge Complex. In addition, a suite of parks and similar areas managed by the state of Florida that existed at the time of sanctuary designation are referred to as existing management areas. Under Alternative 2, ONMS would change the zone name for these areas from “existing management areas” to “management areas.” This proposal would not create any new management areas and would only modify the spatial area of Looe Key Management Area (described below and depicted in Section 3.6). As a result, for all but Looe Key, ONMS expects that this proposed name change would have no impact on biological resources because the change is purely administrative and would not impact management of these areas or the activities occurring in these areas.

Additionally, under Alternative 2, ONMS would implement two regulatory changes: (1) no anchoring in Key Largo and Looe Key management areas, and (2) allowing personal watercraft use in a small portion of Key West National Wildlife Refuge.

Decreasing Looe Key Management Area: Under Alternative 2, ONMS would decrease the Looe Key Management Area to include only the western portion of the existing Looe Key Management Area. The remaining area would be included in a larger Looe Key SPA. This change to the Looe Key Management Area and Looe Key SPA would have **direct beneficial** impacts on the habitats and wildlife that reside or forage in this area due to the additional protections afforded by the SPA regulations including no take and no anchoring.

Beneficial impacts: The no-anchor prohibition that would be applicable to the Key Largo and Looe Key management areas would have a **direct significant beneficial** impact on habitat and associated wildlife that live or forage in these management areas. These beneficial impacts would be significant, particularly to the Key Largo Management Area, because the proposed no-anchor prohibition would be applied to a large area, thus providing long-term benefits to species that inhabit, forage, or transit in these areas. Prohibiting vessel anchoring would have the direct impact of protecting the coral and hardbottom habitats within this area from the potential impacts of anchor and anchor chain damage. Avoiding impacts to coral and hardbottom habitats would result in an **indirect beneficial** impact to wildlife associated with these habitat types by preventing disturbance of these habitats. The impacts of the regulatory change related to personal watercraft use in the Key West National Wildlife Refuge are discussed below (see “Marine zone modification: Motorized personal watercraft”).

Adverse impacts: Implementing a prohibition on anchoring within the Key Largo and Looe Key management areas would not result in adverse impacts to biological resources because this regulatory change would not increase human use of these management areas or result in a higher likelihood of interactions between humans and sensitive wildlife or habitats. ONMS does not expect that this action would shift vessel anchoring activity to other areas of the sanctuary where these restrictions are not in place at such a scale that it would cause adverse impacts to other wildlife and habitats. **No adverse impacts** to biological resources are expected from the proposed new or modified regulations applied in these management areas.

Proposed marine zone modification: Motorized personal watercraft

Under Alternative 2, ONMS would revise existing regulations related to motorized personal watercraft use in FKNMS to allow personal watercraft access to a small portion of Key West National Wildlife Refuge. Under current FKNMS regulations, personal watercrafts are prohibited throughout the Florida Keys National Wildlife Refuge Complex. This proposed update is not expected to increase the overall number of personal watercraft operating in the area but, rather, it is intended to allow for a minor shift in the area where personal watercrafts can operate.

Beneficial impacts: This modification is proposed largely to address a human safety and user conflict issue related to personal watercraft use in Key West. This proposal also has the potential to benefit wildlife in this area, particularly tarpon that are known to congregate in and around this area during their spring migration. The proposed change would move personal watercraft use away from areas frequently used by tarpon and thus reduce the likelihood of vessel disturbance of this species. This would provide a **direct beneficial** impact to biological resources by reducing disturbance to wildlife in the area. This beneficial impact would be **less than significant** because of the small size of the area where personal watercraft use would be allowed.

Adverse impacts: ONMS anticipates that this proposed regulatory change would result in a minor change in the level of personal watercraft use compared to existing levels. Currently, the area of Key West National Wildlife Refuge where personal watercraft use would be permitted is an area with other recreational vessel activity. As such, many organisms occurring in this area are likely tolerant of human activity, or avoid human activity. As a result, this proposed regulatory change would likely result in **negligible adverse** impacts to marine wildlife from disturbance due to use of personal watercraft in the new area.

5.4.1.4 Impacts to biological resources from updates to the FKNMS management plan (Alternative 2)

Under Alternative 2, FKNMS would adopt a proposed updated management plan which includes non-regulatory actions that NOAA would implement to further protect and manage sanctuary resources. See Section 3.5 for the text of the proposed management plan.

Beneficial impacts: The updated management plan activities proposed under Alternative 2 would provide **direct, long-term benefits** to living marine and marine dependent resources in FKNMS. The management plan goals and associated activities are intended to increase understanding of sanctuary resources, to maintain and improve sanctuary resources, and to maintain or increase efforts to reduce threats to sanctuary resources. FKNMS staff would undertake the following activities to work toward achieving these goals: developing a sanctuary restoration plan, testing new ecological restoration approaches, facilitating recovery of ESA-listed coral species, evaluating fishing gear impacts to sanctuary resources, developing best management practices to mitigate impacts, and working with fishery management agency partners to further ecosystem-based management approaches and advance understanding and management of fish aggregation sites. Under Alternative 2, ONMS is also proposing to conduct several activities focused on managing human uses of the sanctuary that may impact sanctuary resources and facilitating a strengthened stewardship ethic. These would include: implementing an updated marine zoning scheme, working with users to inform placement of mooring buoys, implementing a voluntary boater education course, and maintaining and enhancing the Blue Star programs.

These routine education, outreach, research, monitoring, and resource protection activities and coordination with stakeholders would have both **direct** and **indirect beneficial** impacts on the biological resources within FKNMS. These management plan activities would promote ocean literacy and stewardship, and improve the understanding, management, and protection of the sanctuary's biological resources, which provide **indirect beneficial** impacts to habitat, wildlife, and protected species in FKNMS. By promoting ocean stewardship principles with partners, local communities, and the general public, FKNMS has the opportunity to influence the behavior and decision-making of individuals, businesses, communities, organizations, and agencies in ways that could **indirectly benefit** biological resources within the sanctuary.

In general, updating the management plan would allow for a more coordinated and priority-driven effort and, as a result, would support more effective management and conservation-based outcomes for FKNMS. Beneficial impacts to biological resources from revised management plan activities would be **less than significant** because they would not result in a significant change in the state of sanctuary resources over the five-to-10-year lifetime of the management plan.

Adverse impacts: Under Alternative 2, some adverse impacts may occur when implementing activities described in the management plan, such as educational outreach activities, research activities, enforcement activities, and vessel and aircraft operations. Potential adverse impacts associated with these field activities are described in Table 5.2. If ONMS implemented Alternative 2, the potential adverse impacts described in Table 5.2 would be spread over a larger area because this alternative would expand the boundary of the sanctuary. ONMS does not expect that expanding these activities over a larger area would change the intensity of the impacts. As described in Section 5.2.1, these adverse impacts to physical resources would be direct and less than significant. Consistent with the analysis in the draft PEA, ONMS expects that these **direct and indirect adverse effects would be less than significant** because the activities would be short-term and localized, and FKNMS would employ a variety of best management practices to avoid or minimize impacts to the natural and human environment (NOAA 2018b).

5.4.2 Impacts to physical resources (Alternative 2)

This section describes the impacts to physical resources that would occur under Alternative 2. The resource areas analyzed here are oceanography, climate, climate change, and water quality.

5.4.2.1 Impacts to physical resources from proposed sanctuary boundary expansion (Alternative 2)

Under Alternative 2, ONMS would expand the boundary of FKNMS as described above.

Beneficial impacts: Under Alternative 2, the application of current regulations regarding discharge or deposit of materials or other matter into waters of the sanctuary would provide both **direct** and **indirect** benefits to the water quality of the sanctuary and its resources, which includes the habitats and wildlife of the Florida Keys. The sanctuary-wide prohibitions at 15 CFR § 922.163 would apply in the expanded areas proposed in Alternative 2. The application of these regulatory prohibitions to the expansion areas proposed under Alternative 2 would have a **less than significant, beneficial** impact on water quality in FKNMS.

For the proposed boundary expansion areas included in Alternative 2, hardbottom and coral reef habitats would benefit from improved water quality. The application of existing sanctuary regulations regarding

discharge and human use to newly-expanded areas would provide **direct beneficial** impacts to water quality by minimizing potential pollution and discharge related to vessel transit, operations, and accidental spills or leaks.

In addition, the proposed boundary expansion could result in **indirect beneficial** impacts by increasing potential for carbon sequestration within mangrove and seagrass habitats that would be newly-protected under Alternative 2. The inclusion of the Tortugas area in FKNMS would have an **indirect beneficial** impact as the existing sanctuary-wide prohibition on mineral and hydrocarbon exploration, development, and production would apply in this proposed expansion area. Implementing Alternative 2 would therefore avoid emissions associated with any mineral and hydrocarbon exploration, development, and production that could otherwise have taken place in these areas. As indicated through consultation with BOEM, this activity was not likely to occur in the boundary expansion areas regardless of whether they were included in the sanctuary or not. However, the hardbottom and coral reef habitats in the proposed expansion area would benefit through application of sanctuary-wide regulations restricting this activity.

These beneficial impacts would be **less than significant** because of the small scale of the boundary expansion relative to the existing boundary. Under Alternative 2, no regulatory changes are proposed that would restrict vessel emissions. Therefore, ONMS expects no direct or indirect impact on the level of vessel emissions resulting from activities conducted within the sanctuary, and therefore no long-term effect on atmospheric CO₂ impacts on climate change.

Adverse impacts: Expansion of the sanctuary boundary would spread the adverse impacts of current field operations on physical resources (summarized in Table 5.2) over a larger geographic area. As described in Section 5.2.1, these adverse impacts to physical resources would be **direct** and **less than significant**. Consistent with the analysis in the draft PEA, ONMS expects that these adverse effects of field operations would not be significant because the activities would be short-term and localized, and FKNMS would employ a variety of best management practices to avoid or minimize impacts to the natural and human environment (NOAA 2018b). In addition to these current sanctuary regulations, any additional impacts to physical resources in the current sanctuary and proposed expansion area from proposed sanctuary wide-regulatory changes, changes to marine zones and related regulations, and the revised management plan are discussed below in sections 5.4.2.2 through 5.4.2.4. Overall, the beneficial impacts to physical resources would outweigh the negligible and less than significant adverse impacts from expanding the site boundary.

5.4.2.2 Impacts to physical resources from additions and revisions to sanctuary-wide regulations (Alternative 2)

The potential beneficial and adverse impacts to physical resources of each of the additions or updates to sanctuary-wide regulations, proposed under Alternative 2, are discussed below:

Proposed sanctuary-wide regulation update: Prohibit certain cruise ship discharges

Beneficial impacts: Under Alternative 2, ONMS would revise the sanctuary-wide regulations to prohibit certain discharges from cruise ships, such as graywater, scrubber wash water, and other discharges that occur during vessel operations. This proposed update would increase protection of water quality and sanctuary resources from pollutants present in cruise ship discharges. While cruise ship discharges can impact water quality, impacts depend on the characteristics of the discharge (e.g., constituents present,

levels of discharge) and the characteristics of the receiving waters (e.g., currents, temperature). Overall, the proposed prohibition of certain discharges from cruise ships would have a **direct beneficial** impact on water quality in the area transited by the cruise ship and **indirect** impacts in areas further from the source where the water may disperse. These effects to water quality would be **less than significant** given that cruise ships transverse through a relatively small portion of the sanctuary.

Adverse impacts: Implementing the prohibition for certain discharges from cruise ships as proposed in Alternative 2 would not change the level or intensity of current cruise ship activity in FKNMS. Therefore, the proposed regulatory change would have **no adverse** impacts on oceanography, climate, climate change, or water quality in FKNMS.

Proposed sanctuary-wide regulation update: Extend time period for emergency regulations

Beneficial impacts: The proposed modification to the existing emergency regulation at 15 CFR § 922.165 would extend the amount of time that an emergency regulation could be in place. This could have a **direct beneficial** impact on water quality in the existing and proposed boundary expansion areas if an emergency regulation were established to reduce a direct threat to water quality. The significance of these beneficial impacts would depend upon the specific threat to sanctuary resources that this management action would be intended to address.

Adverse impacts: ONMS concluded that extension of the timeframe that an emergency regulation can be in place would further resource protection within the sanctuary and is unlikely to result in any adverse impacts to water quality or other physical resources. All emergency response activities would be conducted in a manner consistent with sanctuary regulations and other statutory requirements in order to protect physical resources. Any adverse impacts to physical resources associated with FKNMS-authorized vessel operations or other emergency response activities are described in Table 5.2. **No adverse impacts** to physical resources are expected from the proposed modification to emergency regulations under Alternative 2.

Proposed sanctuary-wide regulation update: Historical resources permit categories

Beneficial impacts: Historical resource preservation is intimately linked with the physical environment in which the historical resource resides. After a period of degradation, historical resources reach equilibrium with the environment and deterioration slows. ONMS has determined that *in situ* preservation of historical resources is preferred. Limiting excavations to only those necessary to answer scientifically-proposed research questions would reduce impacts to the physical environment. Excavations directed at locating or uncovering historical resources disturb the seafloor and change its character. Additionally, the increased turbidity associated with excavation may degrade water quality by suspending long-buried sediment. Recognizing that human disturbance to historical resources not only affects the resource’s preservation, but also its surrounding physical environment, the proposed historical resources permit category update would result in increased scrutiny of research methodologies to ensure that any proposed excavations are scientifically justified. Given that review of proposed excavations under the new archaeological research permit category is expected to reduce direct changes to the seafloor, sediment disturbance, and turbidity, the proposed regulatory update would result in **direct, less than significant, beneficial** impacts to physical resources.

Adverse impacts: This proposed regulatory update would not increase the amount of research or other activities that could result in adverse impacts to physical resources. Therefore, **no additional adverse** impacts beyond those impacts applicable to all alternatives (see Section 5.2.1) would result from the proposed regulatory change.

Proposed new sanctuary-wide regulation: Prohibit fish feeding

Beneficial impacts: Under Alternative 2, the proposed new prohibition of fish feeding in FKNMS would have a **less than significant beneficial** impact on water quality by reducing localized degradation of sanctuary water quality. While the known practice of fish feeding from vessels is minimal, this prohibition would restrict any additional input of fish food and other products intended to feed and attract fish that could also have an adverse impact on water quality in the immediate and surrounding areas of fish feeding activities.

Adverse impacts: This action would not change human behavior or activities occurring within the sanctuary in a manner that would result in adverse impacts to physical resources. **No adverse** impacts to physical resources are expected from this proposed new regulation on fish feeding.

Proposed new sanctuary-wide regulation: Reduce impacts from vessel groundings, deserted vessels, and harmful matter

Beneficial impacts: The proposed new regulations related to derelict and deserted vessels and leaving harmful matter aboard such vessels would reduce localized degradation of sanctuary water quality. Prohibiting these activities and requiring notification and a removal plan would decrease and shorten the duration of potential adverse impacts to water quality from derelict and deserted vessels. This would result in both **direct** and **indirect less than significant beneficial** impacts on water quality within the sanctuary in both the existing and proposed expanded areas.

Adverse impacts: Due to the minimal potential for localized decline in water quality associated with accidental spills or leaks, **less than significant adverse** impacts would occur from this proposed regulation. Adherence to ONMS best management practices and the NOAA Small Boat Program guidelines would also minimize the potential for adverse impacts. Adverse impacts to physical resources would be similar to those that would occur under Alternative 1 as described in Table 5.2.

Proposed new sanctuary-wide regulation: Clarify appropriate mooring buoy use

Beneficial impacts: Under Alternative 2, there would be no additional water quality impacts specific to the proposed mooring buoy regulations that would prohibit large vessels from using small vessel mooring buoys and that would prohibit overnight use of mooring buoys. These proposed regulations would provide **direct beneficial** impacts to the physical resources of the sanctuary by reducing damage to physical seafloor and reef habitat from large vessels breaking or dislodging buoy anchoring hardware. These proposed regulations would also reduce the total area of seafloor disturbance by providing more mooring buoys for public use and therefore reducing the amount of anchoring damage.

Adverse impacts: The potential adverse impacts to the physical resources could result from local physical substrate disturbance and short-term degradation of water quality during the installation of new and more substantial mooring buoy hardware. Nonetheless, adverse impacts from the expanded mooring buoy program would be **less than significant** due to the implementation of best management practices to

minimize direct impacts such as disturbance of important seafloor structures and **indirect** impact, such as degradation of water quality from unintended spills or leaks.

5.4.2.3 Impacts to physical resources from revisions to marine zone boundaries and regulations (Alternative 2)

Under Alternative 2, there would be no additional beneficial or adverse impacts to the physical (i.e., oceanographic, climate, and climate change or water and water quality) resources of the sanctuary as a result of the proposed marine zone modifications, creation of proposed new marine zones, and modification of associated regulations beyond those impacts discussed in Table 5.2 and Section 5.4.2.2.

5.4.2.4 Impacts to physical resources from updates to the FKNMS management plan (Alternative 2)

Under Alternative 2, FKNMS would adopt a proposed updated management plan which includes non-regulatory actions that NOAA would implement to further protect and manage sanctuary resources. See Section 3.5 for the text of the proposed management plan.

Beneficial impacts: The updated management plan activities proposed under Alternative 2 would provide both **direct** and **indirect long-term** benefits to physical resources within the sanctuary through improved stewardship of sanctuary resources, and further research and restoration activities. Specific examples of these potential impacts are described below.

The proposed management plan would not result in targeted oceanographic impacts. However, some actions in the proposed management plan acknowledge and aim to take advantage of oceanographic currents to provide for long-term protection of resources. For example, activities related to seagrass restoration could indirectly improve water quality by resulting in better nutrient management.

Several proposed management plan activities focus on understanding and addressing potential impacts from climate change. These include, but would not be limited to, continued engagement with the Florida Reef Resilience Program, facilitating recovery of ESA-listed coral species, supporting targeted research activities, and advancing understanding and potential additional stewardship through education and outreach efforts. All these activities are intended to have a **beneficial** impact; however, the impact would likely be **negligible** or **less than significant**.

The proposed management plan includes several activities related to sanctuary water quality. These are generally included in Goal 2, Objective 2 and include: strengthened engagement with the Water Quality Protection Program, engagement at the regional level with the South Florida Ecosystem Restoration Task Force, and a few targeted activities to better identify the sources and potential strategies to address water quality impacts. All of these activities are intended to provide beneficial impacts to sanctuary water quality. The magnitude of these specific activities would be largely dependent on actions undertaken by partner agencies with direct authority over water quality. The associated impacts of these activities could range from **negligible** to **significant** (for example, if some key actions outlined in the Comprehensive Everglades Restoration Plan are completed).

Adverse impacts: Under Alternative 2, some adverse impacts may occur when implementing activities described in the management plan, such as educational outreach activities, research activities, enforcement activities, and vessel and aircraft operations. These potential direct adverse impacts to physical resources would be similar to those associated with field operations, which are described in

ONMS's draft PEA and summarized in Table 5.2. The adverse impacts to physical resources from field operations would be direct and less than significant. If ONMS implemented Alternative 2, the potential adverse effects to water quality and other physical resources would be spread over a larger area because this alternative would expand the sanctuary. ONMS does not anticipate that expanding these activities over a larger area would change the intensity of the impacts. Therefore, ONMS expects that implementing a revised management plan would result in **less than significant adverse impacts** because the activities would be short-term and localized, and FKNMS would employ a variety of best management practices to avoid or minimize impacts to the natural and human environment.

5.4.3 Impacts to cultural and historical resources (Alternative 2)

This section describes the impacts to cultural and historical resources that would occur under Alternative 2.

5.4.3.1 Impacts to cultural and historical resources from the proposed sanctuary boundary expansion (Alternative 2)

Beneficial impacts: Under Alternative 2, the proposed expansion of FKNMS would have a **direct beneficial** impact on cultural and historical resources in the expansion areas through application of the existing regulation prohibiting movement of, removal of, injury to, or possession of sanctuary historical resources. This beneficial impact is expected to be **significant** as it extends protections to several known shipwrecks just outside the current FKNMS boundary but within the ATBA. Boundary expansion may further protect historically-reported vessels sunk in deep water that are expected to have even greater site integrity due to their inaccessibility.

Adverse impacts: NOAA research activities that seek to locate and document newly-included cultural and historical resources could result in **direct or indirect, less than significant, adverse impacts** to these resources. For example, there is a slightly increased risk of looters targeting and illegally removing artifacts from newly discovered historical resources if they, for example, observed NOAA conducting research at a site then returned at a later time to conduct illegal activities. However, the likelihood of this occurring is minimal since such conduct would be illegal and subject to civil penalties and criminal punishment under the National Marine Sanctuaries Act. As a result, the adverse impacts on cultural and historical sanctuary resources from the proposed expansion would likely be **less than significant** due to the use of best management practices to minimize direct impacts.

5.4.3.2 Impacts to cultural and historical resources from additions and revisions to sanctuary-wide regulations (Alternative 2)

Proposed sanctuary-wide regulation update: Improve historical resource permitting process

Under Alternative 2, NOAA would update the historical resources permitting process to improve resource protection and more closely align NOAA permitting regulations with those of the Florida Department of State Division of Historical Resources (DHR). The specific updates, as described in more detail in Section 3.2.5, consider the sensitive, non-renewable character of historical resources and the shared stewardship responsibilities of NOAA and Florida DHR. Changes to historical resources permitting would eliminate the current survey/inventory, research/recovery, and deaccession/transfer permit categories and institute an archaeological research permit category.

Beneficial impacts: Under Alternative 2, the proposed update to historical resources permit categories would have a **direct beneficial** impact on historical resources in the sanctuary. This benefit would be **significant** as it would improve the quality of information generated from historical resource permits. Proposed changes would better align FKNMS permitting regulations with Florida DHR archaeological research permit standards and the Federal Archaeological Program. The result would be a more efficient permitting process that limits permits to scientifically-justified investigations and better accounts for the non-renewable nature of historical resources.

Adverse impacts: Under Alternative 2, the potential adverse impacts to cultural and historical resources from implementing this proposed regulation to the sanctuary's cultural and historical resources would be **negligible**. Revised permit standards and conditions would limit impacts to historical resources and their surrounding habitat. The proposed updated permit category is intended to address concerns about unscientific investigations, ensure resources would not be damaged, and facilitate greater coordination across historical resource management partners in the state and sanctuary.

5.4.3.3 Impacts to cultural and historical resources from revisions to marine zone boundaries and regulations (Alternative 2)

Beneficial impacts: Several of the existing and proposed modified or new marine zones under Alternative 2 would encompass historical resources, including lighthouses and shipwrecks listed on the National Register of Historic Places. Such historical resources include, among others, the Austrian ship *Slobodna* at Molasses Reef SPA, HMS *Winchester* at Carysfort SPA, and the British warship HMS *Looe* at Looe Key EMA. Under Alternative 2, ONMS would strengthen regulations in these marine zones to include some no-anchor areas. This would have potential **direct beneficial** impacts on these resources by reducing the risk of potential anchor damage to historical resources present in these zones. Expanding marine zones to encompass historical resources and applying a no-anchor prohibition in those marine zones would prevent additional degradation of known, and potentially some unknown, historical resources. Similarly, limiting fishing activity in new marine zones would prevent **direct adverse** impacts to historical resources that could result from contact with fishing gear when it is deployed or recovered. These beneficial impacts would be **negligible** because of the wide distribution of historical resources throughout marine zones in FKNMS and the associated low likelihood of anchor damage from vessels operating in these areas.

Adverse impacts: Encompassing more historical resources within marine zones or within marine zones with additional activity regulations designed to protect sanctuary habitats and natural resources conveys additional protections to the historical resources as well. ONMS does not expect that the proposed changes to marine zones in Alternative 2 would change activities occurring within the sanctuary in a way that would result in adverse impacts to cultural and historical resources. **No adverse impacts** to cultural and historical resources are expected from the proposed updated zones and regulations.

5.4.3.4 Impacts to cultural and historical resources from updates to the FKNMS management plan (Alternative 2)

Beneficial impacts: Under Alternative 2, ONMS would implement several proposed management plan activities that focus on understanding and managing historical resources in the sanctuary, most notably Goal 1, Objective 2 and, to a lesser degree, Goal 4, which focuses on increasing awareness of sanctuary resources. Specific activities include: improving the inventory and characterization of historical resources,

better understanding visitor use and mitigating potential impacts of that use, and implementing archaeological research standards through the proposed updated permit categories. Management plan activities directed at interpreting historical resources for the public provide an avenue to disseminate the results of permitted research and ONMS inventory efforts. All of these activities would have **direct beneficial significant** impacts on historical resources in the sanctuary because they would support the long-term protection, preservation, and appreciation of these resources.

Adverse impacts: Under Alternative 2, **direct adverse** impacts to historical resources may occur when implementing activities described in the management plan. In situations where management activities identify historical resources for public visitation, visitors using improper anchoring, diving, or snorkeling techniques may adversely impact the historical resource. Similarly, identification of a historical resource for visitation may lead to its overuse, which could result in exacerbated impact from improper techniques. The adverse impacts of these activities are expected to be **less than significant** because they would be mitigated by the use of best management practices to avoid improper techniques. **Direct adverse** impacts to historical resources associated with other categories of routine field activities are described in Table 5.2.

5.4.4 Impacts to socioeconomic resources and human uses (Alternative 2)

This section describes the impacts to socioeconomic resources and human uses that would occur under Alternative 2.

5.4.4.1 Impacts to socioeconomic resources and human uses from the proposed sanctuary boundary expansion (Alternative 2)

Alternative 2 would expand the sanctuary boundary to include the ATBA and Tortugas region, for a total of 4,541 square miles.

Beneficial impacts: Applying existing and proposed updated and new sanctuary-wide regulations in the proposed expansion area would protect coral reef habitats from discharge pollution and damages caused by groundings of large vessels transiting the region. Past groundings have resulted in millions of dollars in damages and restoration costs, both in terms of **direct** costs to industry to clean up the grounding as well as in **indirect** cost by degrading sanctuary habitats that serve as an important driver for tourism. A significant portion of the Monroe County economy is dependent on coral reef resources. Applying sanctuary regulations to the expanded area would ensure the National Marine Sanctuaries Act and FKNMS regulations apply to protect additional resources, bring enforcement actions, and recover damages and restoration costs for any harm done to such resources.

Expanding the boundary would also increase opportunities for passive economic use², science, and education values. Sobel (1996) described the many benefits provided by marine reserves, including

² Nonuse or passive use economic values encompass what economists refer to as option value, existence value, and other nonuse values. All nonuse economic values are based on the fact that people are willing to pay some dollar amount for a good or service they currently do not use or consume directly. In the case of an ecological reserve, they are not current visitors (users), but derive some benefit from the knowledge that the reserve exists in a certain state and are willing to pay some dollar amount to ensure that actions are taken to keep the reserve in that state.

scientific and educational activities that increase knowledge and understanding of marine systems. A summary of these benefits include:

Scientific benefits

- Provides long-term monitoring sites;
- Provides focus for study;
- Provides continuity of knowledge in undisturbed site;
- Provides opportunity to restore or maintain natural behaviors;
- Reduces risks to long-term experiments; and
- Provides controlled natural areas for assessing anthropogenic impacts, including fishing and other impacts.

Educational benefits

- Provides sites for enhanced primary and adult education; and
- Provides sites for high-level graduate education.

Adverse impacts: The primary adverse impact from expanding the proposed sanctuary would be an increase in administrative and enforcement costs in order to manage the expanded areas of the sanctuary. These costs would include those currently expended to operate and manage the current sanctuary, as described in Section 5.2.1, as well as the minimal additional cost to operate and manage the proposed expansion area. The net increase in costs would be non-significant because the sanctuary would be conducting the same activities as those described in Section 5.2.1, but over a slightly larger area. Therefore, expanding the sanctuary would result in **insignificant direct adverse impacts**.

5.4.4.2 Impacts to socioeconomic resources and human uses from additions and revisions to sanctuary-wide regulations (Alternative 2)

The potential beneficial and adverse impacts to socioeconomic resources and human uses from additional and revisions to sanctuary wide regulations are described below.

Proposed sanctuary-wide regulation update: Prohibit certain cruise ship discharges

Under Alternative 2, updated regulations would prohibit certain discharges from cruise ships within the sanctuary.

Beneficial impacts: Water quality is fundamental to all water-based recreation-tourism uses in FKNMS, as well as to commercial fishing and the protection of the quality of the food supplied by this industry. Prohibiting certain discharges from cruise ships would result in better protection of water quality and habitat for corals, fish, and other species that directly support the water-based recreation-tourism and commercial fisheries within FKNMS. As described in Section 5.4.2.2, the proposed prohibition of certain discharges from cruise ships would have a **direct beneficial** impact on water quality in the area transited by the cruise ship and **indirect** impact in areas further from the source where the water may disperse. Therefore, prohibiting certain cruise ship discharges would result in **indirect and direct beneficial impacts** to the water-based recreation-tourism and commercial fishery within FKNMS.

Adverse impacts: In order to comply with the proposed regulatory change under Alternative 2, cruise ships would need to switch to a higher grade fuel while operating in FKNMS since scrubber wash water

is one of the types of discharges that would be prohibited. In addition, cruise ships would need to either install improved technology to treat various waste streams prior to discharging within the sanctuary, or wait until the cruise ship has exited the sanctuary prior to discharging waste. Given that cruise ships generally travel through the sanctuary for a limited amount of time (12 operational hours or less), costs to the cruise ship industry would be minimal since they would be able to discharge once outside sanctuary boundaries and would only need to use higher grade fuel for a limited time. For cruise ships that dock in Key West, the vessel(s) would have to suspend most discharge activity until departing the sanctuary. However, given that cruise ships are restricted from docking overnight in Key West, the amount of time that a ship would be required to alter some discharge activities would be minor. Due to the short amount of transit time during which discharge practices would be altered, the increased regulation would have **direct negligible adverse** impacts to the cruise ship industry.

Proposed sanctuary-wide regulation update: Extend time period for emergency regulations

Under Alternative 2, existing regulations would be updated to allow a temporary emergency regulation to be in effect for up to six months (180 days), with one six month (additional 186 day) extension.

Beneficial impacts: Emergency regulations would allow the sanctuary to respond to emergencies and unforeseen impacts to sanctuary resources to prevent or minimize the destruction of, loss of, or injury to a sanctuary resource or the quality of the resources, as described in Section 5.4.1.2. Better protection of sanctuary resources, such as corals, seagrass, fish, and other biota, would have **direct beneficial impacts** because these natural resources directly support the water-based recreation-tourism and commercial fishery within FKNMS.

In order for sanctuary staff to implement emergency regulations and associated clean-up or other measures, some recreation, research, and other activities may be temporarily disrupted to ensure that the emergency response is conducted efficiently and to minimize the potential for the public to be exposed to any unsafe conditions. These activities would result in short-term benefits for public safety and, as discussed above, long-term gains in the protection of sanctuary resources to ensure the future flow of recreational-based benefits.

Adverse impacts: Extending the length of emergency regulations could result in a temporary disruption to some recreational, research, and other activities to ensure that the emergency response is conducted efficiently and to minimize the potential for the public to be exposed to any unsafe conditions. This disruption would be short-term, and nearby alternative locations would most likely be available for recreational, research, and other activities. Therefore, the **adverse impacts** would be **negligible** and **short-term**. In the long-term, there would be no adverse impacts since NOAA is proposing temporary regulations.

Proposed sanctuary-wide regulation update: Improve historical resource permitting process

Under Alternative 2, NOAA would update the historical resources permitting process to improve resource protection and more closely align NOAA permitting regulations with those of the Florida DHR. The specific updates, as described in more detail in Section 3.2.5, consider the sensitive, non-renewable character of historical resources and the shared stewardship responsibilities of NOAA and Florida DHR.

Beneficial impacts: Although an economic valuation study has not been conducted in the Florida Keys on historical maritime heritage and cultural resources, a study completed on the Graveyard of the Atlantic

(Mires 2014), which includes Monitor National Marine Sanctuary, found that people's willingness to pay for historical resource protection and interpretation of maritime heritage increased with:

- Expansion of the number of shipwrecks protected;
- The level of investment in museum exhibits;
- Educational workshops on maritime heritage and training in maritime archaeology; and
- Maritime heritage trails, including virtual trails using video and mobile phone technology.

The expanded protections offered by improving the research permit process for the historical resources in FKNMS would be expected to yield more of each of the benefits estimated by Mires (2014). Changes to historical resources regulations are expected to favor professional archaeological investigations that provide the greatest benefit to the public. Information generated by scientifically-rigorous investigations focused on revealing the sanctuary's past would benefit dive shops, charter operators, other tour operators, museums, and cultural institutions, and add depth to the history that many people seek to learn about the Florida Keys. An example of the value of these investigations are archaeological site maps and documentation of the historical context of shipwrecks commonly visited by divers.

The impacts from revisions to historical resource permitting processes, proposed in Alternative 2, would be **beneficial** and **less than significant** in both the short-term and long-term. Professionally-conducted, scientifically-rigorous historical resource investigations would increase enjoyment of these non-renewable resources by current and future generations.

Adverse impacts: Historical resource permittees would be the most likely to be adversely impacted by the regulatory update; however, adverse impacts would be **less than significant** as most, if not all, permittees are expected to be able to continue their investigations if they make minor changes to their methodologies and personnel. In several cases, no changes would need to be made by the permittees because they already conduct their research using scientifically-based, minimally-intrusive methods that would be in compliance with the proposed permitting updates.

As the likelihood of locating monetarily valuable artifacts through historical resource surveys is fleetingly small, the adverse impacts from removal of the deaccession/transfer permit category of historical resources permits is **less than significant**. The last significant treasure find outside of the salvage of *Nuestra Señora de Atocha* and *Santa Margarita* was made in 1991 (NOAA 1997). The administrative costs associated with permitting should decline with the streamlined and more efficient permit process proposed. NOAA's costs relating to the inventory of historical resources are also not expected to increase as most, if not all, permittees would transition to the new permit structure.

In some cases, costs to current permittees may increase due to the need to work with a professional archaeologist, whose training and experience meets the Secretary of the Interior's professional qualification standards for archaeology. Under the proposed permitting process, an individual meeting these standards must be involved in the project to direct the archaeological research. Prospective permittees may wish to partner with universities or other organizations specializing in underwater archaeological research to satisfy the requirement. Similarly, operational costs may increase as permittees may need to invest more resources in scientific survey methodologies and reporting of their survey results.

The proposed permit revision eliminating provisions for a deaccession/transfer permit would not affect any current permittees as no such permits have ever been issued. Removal of this permit category may decrease the potential incentive/reward for locating certain varieties of artifacts; however, it is in keeping with the NMSA purposes and policies to enhance the sustainable use of the National Marine Sanctuary System's historical resources. In addition, dispersal of artifacts is contrary to archaeological standards set forth by the Federal Archaeology Program. The Federal Archaeological Program comprises a collection of historical and archaeological resource protection laws, including, among others, the National Historic Preservation Act, Archaeological Resources Protection Act, Antiquities Act, and Abandoned Shipwreck Act, to which federal managers must adhere. Archaeological recovery of sanctuary artifacts must be justified by scientific research questions and be in the public's interest, and would only be allowed for abandoned vessels or with express permission from the owner or sovereign. Permittees must demonstrate the financial ability to conserve and curate the artifacts. Permittees may exhibit recovered artifacts under a curatorial services agreement with NOAA, but such recovered artifacts would remain public resources. The proposed regulatory changes would not terminate valid Federal Admiralty Court rights of access granted prior to sanctuary designation, which FKNMS recognized at the time of sanctuary designation. (See NOAA 1997, p. 99.) Likewise, elimination of the deaccession/transfer permit would not affect such rights of access and adjudication of title to artifacts recovered in accordance with such valid Federal Admiralty Court orders. However, all historical resource activities conducted in FKNMS are subject to and must comply with the National Marine Sanctuaries Act, the Florida Keys National Marine Sanctuary and Protection Act, and sanctuary regulations.

The effects of this regulatory change can best be determined by examining who it may affect. While the lure of discovering shipwrecks and sunken treasures appeals to many, the reality is that underwater archaeological survey and excavation is an expensive undertaking with an exceedingly small chance of recouping costs. Most FKNMS historical resources permittees investigate the sanctuary's waters for the thrill of discovering untold stories of the past. Currently, there are seven individuals who hold eight FKNMS historical resources permits. One individual holds two research/recovery permits, one each for the *Nuestra Señora de Atocha* and *Santa Margarita* shipwrecks. The remaining six individuals hold survey/inventory permits. Three of the survey/inventory permittees hold permits to pursue non-consumptive archaeological research as part of a university or not-for-profit organization. The remaining three survey/inventory permit holders seek to find significant colonial-era shipwrecks. Beyond the individual permittees themselves, the number of persons engaged in work on these permits varies from more than a dozen for the research/recovery permits, to one or two persons for the survey/inventory permits.

Proposed new sanctuary-wide regulation: Prohibit fish feeding

Fish feeding is conducted throughout the Florida Keys in order to quickly attract relatively high numbers of fish. This activity may occur from boats, or within the water by divers and snorkelers. Very few dive operators feed fish during recreational outings. Fish feeding activities also occur from shore-based facilities; however, regulating that activity was considered but eliminated from this analysis (see Section 3.7). NOAA is proposing a new regulation to explicitly prohibit fish feeding and its threat to sanctuary resources.

Beneficial impacts: The proposed regulation would benefit the water-based tourism industry in the long term because it would prevent the damaging ecological impacts fish feeding can have on fish

communities, as described in Section 5.4.1.2. This benefit would be **negligible** because very few diving operations in the Florida Keys conduct this type of activity. Given the competition among dive operations in the Florida Keys, and the ease with which fish feeding could provide a marketing edge, the proposed regulation would also prevent any future increase in fish feeding practices. In addition, the proposed regulation would increase human safety as fish who are not habituated to being fed would be less likely to approach snorkelers or divers looking for food.

Adverse impacts: The main adverse impact would be a cost to dive operators who currently feed fish and would lose potential customers if they stopped this practice. The overall costs spread across all businesses would be **less than significant**, since few dive operations engage in this practice, as it is already prohibited by state rules. However, for the few operators that feed fish, the proposed regulations could have substantial impacts on their individual businesses. The dive business is highly competitive and a low margin of profit business. The few businesses that are impacted might struggle to stay in business if the market niche that they have carved out for themselves is eliminated. Over the long-term, these costs might be expected to increase as the tourist market grows.

Proposed new sanctuary-wide regulation: Reduce impacts from vessel groundings, deserted vessels, and harmful matter

Currently, removal of grounded or deserted vessels and the harmful matter aboard such vessels (e.g., motor oil, fishing gear that could cause entanglement) is not specifically required unless a discharge has occurred, there is an alteration to the seabed, or there is destruction, loss, or injury to a sanctuary resource. Existing FKNMS regulations also do not include a requirement to provide notice of a grounded vessel.

To address concerns regarding the potential threats to the marine environment from derelict or deserted vessels, NOAA is proposing regulations that would enable NOAA to hold owners of derelict, grounded, or deserted vessels liable for any associated damage to sanctuary resources and help facilitate removal of vessel debris and minimize resulting impacts.

Beneficial impacts: The potential for harm to sanctuary resources from derelict and/or deserted vessels is very high: damage assessments and restoration activities to remove and remediate vessel groundings have cost millions of dollars. The proposed additional regulations would minimize future damage to sanctuary resources and help to protect a multi-billion-dollar economy dependent on the sanctuary's resources. In addition, proposed regulations would better enable NOAA to enforce removal of deserted vessels to prevent potential groundings, collisions, or discharge of harmful materials that could harm FKNMS resources. Therefore, the protections from the proposed regulation would result in **significant potential beneficial** impacts in the short and long-term.

Adverse impacts: The main adverse impact from these regulations would be the cost to industry or owners of vessels that become derelict, grounded, or deserted within FKNMS. The vessel owner would be required to contact the sanctuary and conduct (or pay for) immediate activities to mitigate and/or prevent injury to sanctuary resources. However, the costs associated with these immediate mitigation and/or prevention activities would likely still be less than costs that could result if no such immediate activities were taken and the vessel discharged harmful matter into the sanctuary. Therefore, the proposed regulation would result in **insignificant adverse** impacts.

Proposed new sanctuary-wide regulation: Clarify appropriate mooring buoy use

Mooring buoy use by large vessels can damage the mooring buoy hardware and in some cases the substrate in which the hardware has been secured. Alternative 2 proposes to implement a large vessel mooring buoy requirement that helps to clarify appropriate mooring buoy use for large vessels.

Beneficial impacts: By clarifying which type of mooring buoys large vessel would use, the mooring buoy repair costs and the damage to the hardbottom and surrounding habitat when the mooring buoys are pulled loose would be reduced. Large vessel owners would also benefit from avoiding fines for damaging the natural environment. Therefore, the proposed regulation would result in **insignificant beneficial** impacts.

Adverse impacts: The adverse impacts to the sanctuary would include the cost of supplies to construct more substantial mooring buoys that could sustain the weight of larger vessels and develop signage for boat operators that clearly label mooring buoys appropriate for larger vessels. In addition, implementation of these regulations would result in costs related to staff or contractor time to modify the mooring buoys and place the signs near the mooring buoys. The resource requirements (in terms of staff time and money) would be a very small portion of the FKNMS overall budget. Therefore, the proposed regulation would result in **negligible adverse** impacts.

5.4.4.3 Impacts to socioeconomic resources and human uses from changes to marine zone boundaries and regulations (Alternative 2)

Under Alternative 2, ONMS would modify existing marine zones and create new marine zones to provide additional protection for specific habitat types that are heavily impacted by human use. The below analysis is divided into two main sections. First, ONMS evaluated the impact from all the marine zone changes that would result in greater habitat protection and human use restrictions due to the integrated nature of the impacts. This includes the following zoning and regulatory changes:

- Expand the total number of marine zones from 57 zones to 96 zones.
- Implement new and revised marine zone regulations within four zone types, including:
 1. Wildlife management areas (WMA),
 2. Sanctuary preservation areas (SPA),
 3. Conservation areas, and
 4. Management areas.
- Implement two new zoning regulations, including:
 1. Eliminate catch and release fishing in four SPAs (as described in Section 3.4.3), and
 2. Revise motorized personal watercraft restrictions within Key West National Wildlife Refuge (as described in Section 3.4.1).

Second, ONMS evaluated the impacts of the proposed modifications that would eliminate the issuance of baitfish permits in all SPAs. Eliminating the issuance of baitfish permits in all SPAs would have a direct cost to some fishermen who would need to purchase baitfish rather than fish for them in SPAs.

Proposed Marine zone modifications: Increased zones and more protective regulations within wildlife management areas, sanctuary preservation areas, conservation areas, and management areas.

Alternative 2 would expand the total number of different zones from 57 zones in the no action alternative (Alternative 1) to 96 zones. Many of these zoning changes would further restrict human use and recreational activities throughout the sanctuary. An overview of the main beneficial and adverse impacts from the proposed changes is provided below. See Leeworthy et al. (2019) for additional information, including the methods, assumptions, and detailed quantified costs and benefits for each component of Alternative 2.

Beneficial impacts: Adding more restrictive marine zones that limit human use and activities would provide areas for fish, whales, sea turtles, and other aquatic biota to forage, breed, and tend to young without the adverse impacts associated with fishing, recreational activities, and other human uses. These restricted areas often lead to increased population health and growth for fish and other aquatic biota. Some mobile organisms may breed, hatch, or grow within the restricted areas, and then migrate to other non-restricted areas within the sanctuary. The overflow of organisms from restricted areas to non-restricted areas increases the overall density and abundance within the non-restricted areas. This phenomenon is often referred to as replenishment. Previous studies in other marine sanctuaries have shown significant long-term benefits from adding restrictive zones that lead to replenishment within non-restrictive zones (e.g., Leeworth et al. 2019). For example, restricting certain areas within marine sanctuaries has shown to increase the quality of marine life in the non-restricted areas, thus benefiting those engaged in non-consumptive forms of recreation via scuba diving, snorkeling, and wildlife viewing. Similarly, fish stocks surrounding restricted areas are often higher due to the greater reproductive and growth rates within the restricted area, and then subsequent migration to non-restricted areas. Further, Leeworthy et al. (2012) found little to no economic impact on fishermen as a result of the no-take marine reserve within the Tortugas Ecological Preserve because fishermen were able to relocate to other fishing grounds and make up for the lost catch due to the closure of the restricted areas (see Leeworthy Chapter 6 in Jeffrey et al. 2012).

For this analysis, Leeworthy et al. (2019) quantified the benefit to the tourism industry by estimating the increased recreational activity, assuming that a larger, healthy ecosystem would attract more recreational tourists to the sanctuary. The study specifically assumed that since 9.29 percent of additional habitat would be protected, the amount of recreational activity would increase similarly. Leeworthy et al. (2019) determined that implementing the marine zones and regulations under Alternative 2 would result in a potential increase of approximately 209.5 thousand days that an individual visits the sanctuary to either view wildlife, snorkel, scuba dive, or partake in another form of non-consumptive recreation activity. This is an increase of about 9 percent in activity, which would have an annual non-market economic value estimated at over \$14.1 million. The non-market economic value is the estimated amount users would be willing to pay to maintain the health of the reefs.

In addition to the non-market economic value of potential benefits, the increase in activity supported by the improved condition of sanctuary resources would have potential benefits in increased spending in the Monroe County economy and the associated economic impacts on output, income, and the number of full- and part-time jobs. Leeworthy et al. (2019) estimated that implementing the marine zones and regulations would have the following potential benefits:

- Additional expenditures: \$30.3 million in additional spending associated with non-consumptive recreation, including scuba, snorkeling, and wildlife viewing tours; hotels; food; car rentals, etc.

- These expenditures/spending (associated with non-consumptive recreation) within Monroe County could lead to an increase of approximately:
 - \$34.0 million in output, which measures the total value of the production of goods and services (those items consumers are purchasing and what businesses need to have/purchase to support those consumer needs) supported by the consumer expenditures, and is equal to the sum of all intermediate sales (business to business sales) and final sales (sales of businesses to consumers);
 - \$14.9 million in income, which is the total value paid to workers and includes employee compensation and proprietor income; and
 - 420 full and part-time jobs.

Therefore, the revisions to the marine zone boundaries and regulations under Alternative 2 would likely result in long-term, **direct, less than significant beneficial impacts** to the water-based recreational tourism industry and commercial fishermen. In the long term, these beneficial impacts associated with increased biota and fishing stocks outside the restricted areas may be larger than the costs associated with the loss of area for fishing (as described below). In this case, the overall impact would be net-beneficial to the Monroe County Economy.

In addition, replenishment would also result in **indirect negligible benefits** to the local tourism industry due to the increase in visitors to the region and concomitant spending within Monroe County.

Adverse impacts: Restricting access to certain areas could result in **less than significant adverse** impacts because it would decrease the amount of area available for recreational users, the tourism industry, and commercial fishermen. In some areas, such as in a conservation area, the proposed marine zoning under Alternative 2 would completely displace all users because of the transit-only regulation. Nonetheless, non-restricted areas would remain available and could adequately support current levels of recreation, tourism, and fishing within the sanctuary. In the longer-term, if these areas experience replenishment effects (e.g., increasing the total stock sizes and the health of coral reef ecosystems), the benefits may outweigh the costs, resulting in a net benefit.

Leeworthy et al. (2019) quantified the potential costs to commercial and recreational fishermen from the loss in area available for fishing due to the creation of additional marine zones. The study determined that the maximum potential loss to commercial fishing revenue annually would be \$585,216, which is 1.00 percent of all commercial fishing revenue in FKNMS. In addition to lost revenue, Alternative 2 would result in a loss of \$1,047,764 in output (the value of production supported by the commercial fishermen's activities). The total loss across all businesses could be up to \$649,613 in annual income and 15 jobs. These numbers reflect a conservative, worst-case scenario in terms of costs and therefore, actual costs would likely be lower.

Leeworthy et al. (2019) estimated a maximum of 78,808 person-days of recreational fishing annually that would be displaced by the proposed marine zones under Alternative 2. This lost time represents a decrease in spending by almost \$13,032,120. This spending is then associated with a loss of about \$14,595,975 in output, \$6,776,650 in income, and 40 full- and part-time jobs in the local economy.

Proposed update to marine zoning regulations: Elimination of baitfish permits

Under Alternative 2, NOAA would eliminate the practice of issuing baitfish permits over a three-year period following the effective date of final regulations. During this time, only individuals who have historically held baitfish permits would be issued any further permits. Baitfish permit data from 2019 would be used to determine those eligible for permits in the three-year phase out period. (Additional background on baitfishing activity is available at Leeworthy et al. 2019.)

Beneficial impacts: Eliminating baitfish permits would be consistent with other SPA regulations, as other SPAs are no-take areas. This regulatory change would result in reduced cost to the sanctuary because of the lower enforcement costs and would eliminate the administrative costs associated with issuing baitfish permits. Given the potential ecological harm that baitfishing can result in (as described in Section 5.4.1.3), the regulation may also help increase the density and abundance of baitfish and their predators, thereby increasing the recreational value for water-based users of the sanctuary. Thus, the proposed regulatory change is expected to result in **direct and indirect less than significant beneficial** impacts.

Adverse impacts: In order to comply with the baitfish regulatory change proposed in Alternative 2, fishermen currently catching their own bait would either have to buy their bait or catch their bait outside the SPAs. If fishermen or charter operators have to pay for bait, the cost could be between \$16,746 and \$26,793 for all cast net permit holders per year, or between \$161 and \$258 per permit holder annually. If fishermen are able to pass these costs onto customers, fishermen would not experience lost profits, but the losses would be transferred to customers in the form of increased fish prices. Fishermen would likely be able to catch their bait outside the SPAs, given that 50 percent of current fishermen catch baitfish outside the SPAs. Under this scenario, fishermen and their customers would not experience increased costs. Given the value of water-based recreational uses, primarily scuba diving and snorkeling, the enhanced value of the recreational experience would more than offset the potential costs to baitfish permit holders. In addition, the **indirect** benefit from increased tourism that would result in increased income to residents of Monroe County would more than offset the potential losses from bait fishing. Therefore, this regulation is expected to result in an overall net benefit and **direct, negligible** adverse impacts.

5.4.4.4 Impacts to socioeconomic resources and human uses from updates to the FKNMS management plan (Alternative 2)

Beneficial impacts: Under Alternative 2, ONMS would conduct several activities focused on managing human uses of the sanctuary that would facilitate a strengthened stewardship ethic. These would include: working with users to inform placement of mooring buoys, implementing a voluntary boater education course, and maintaining and enhancing the Blue Star programs. These routine education, outreach, research, monitoring, resource protection activities, and coordination with stakeholders would have both **direct** and **indirect beneficial** impacts on the socioeconomic resources and human uses within FKNMS. These management plan activities would promote ocean literacy and stewardship and improve the understanding, management, and protection of the sanctuary's biological resources, which provide **indirect beneficial** impacts for recreational activities and tourism. By promoting ocean stewardship principles with partners, local communities, and the general public, FKNMS has the opportunity to influence the behavior and decision-making of individuals, businesses, communities, organizations, and agencies in ways that could **indirectly benefit** the sanctuary.

Adverse impacts: Under Alternative 2, some adverse impacts may occur when implementing activities described in the management plan, such as research activities, enforcement activities, and vessel and aircraft operations. These potential **direct adverse** impacts, such as disruptions to recreational activities, would be similar to those associated with field operations, which are described in ONMS’s draft PEA and summarized in Table 5.2. If ONMS implemented Alternative 2, the potential adverse impacts described in Table 5.2 would be spread over a larger area because this alternative would expand the sanctuary. ONMS does not expect that expanding these activities over a larger area would change the intensity of the impacts. As described in Section 5.2.1, these adverse impacts to socioeconomic resources and human uses would be **direct** and **less than significant**. Therefore, ONMS expects that **direct** and **indirect adverse impacts** from a revised management plan would be **less than significant** because the disruptions would be short-term and localized, and FKNMS would employ a variety of best management practices to avoid or minimize impacts to the natural and human environment.

5.5 Impacts specific to Alternative 3

This section describes the beneficial and adverse impacts of (1) boundary expansion, (2) updated and new sanctuary-wide regulations, (3) marine zone boundary and regulatory changes, and (4) a new management plan. Alternative 3 includes many of the same components as Alternative 2. Alternative 3, however, aims for greater overall protection than Alternative 2 by updating one sanctuary-wide regulation, adding additional marine zones, and implementing more protective marine zone regulations and access restrictions than Alternative 2. Specifically, Alternative 3 would include the following:

Sanctuary boundary expansions:

- The same boundary as Alternative 2.

Revised and new sanctuary-wide regulations:

- The same proposed new and revised sanctuary-wide regulations as Alternative 2.
- A non-regulatory update to provide additional coordination of live rock aquaculture activities.
 - Note that the non-regulatory update would not result in direct, indirect, or cumulative impacts on any sanctuary resources in the existing sanctuary or proposed expansion area because activities would be limited to administrative tasks.

Marine zone boundary and regulatory changes:

- Expand the total number of marine zones from 57 areas to 98 (two more marine zones than Alternative 2).
- More protective marine zone regulations and access restrictions than would be implemented in Alternative 2.

Updated management plan:

- The same management plan as Alternative 2. (For the draft management plan text, see Section 3.5.)

Impacts from Alternative 3 would include:

- The impacts common to all alternatives (see section 5.2);

- Several of the same impacts as Alternative 2, given that both alternatives have the same proposed boundary expansion, sanctuary-wide regulations, and management plan, as specified below; and,
- Impacts specific to Alternative 3, as described below.

5.5.1 Impacts to biological resources (Alternative 3)

This section describes the impacts to biological resources that would occur under Alternative 3.

5.5.1.1 Impacts to biological resources from proposed sanctuary boundary expansion (Alternative 3)

The impacts to biological resources from the proposed sanctuary boundary expansion under Alternative 3 would be the same as the impacts under Alternative 2 (as described in Section 5.4.1) because the proposed boundary expansion would be the same under alternatives 2 and 3.

5.5.1.2 Impacts to biological resources from additions and revisions to sanctuary-wide regulations (Alternative 3)

The impacts to biological resources from changes to sanctuary-wide regulations under Alternative 3 would be the same as the impacts under Alternative 2 (as described in Section 5.4.2) because the proposed changes would be the same under alternatives 2 and 3.

5.5.1.3 Impacts to biological resources from revisions to marine zone boundaries and regulations (Alternative 3)

Under Alternative 3, ONMS would modify existing marine zones and create new marine zones to provide additional protection for specific habitat types, for habitat areas that are heavily impacted by human use, and for wildlife associated with these habitats. ONMS would also revise regulations governing uses of individual marine zones. See Section 3.6 for details on the individual marine zones, and Section 3.3 for a summary of access restrictions in the marine zones.

The marine zone scheme proposed in Alternative 3 would protect additional habitat types and, in some cases, create zones to facilitate connectivity of habitat and wildlife. The higher level of habitat protection is intended to provide a higher level of protection for wildlife species that use these habitats for nesting, roosting, and foraging, for a portion of or for the entirety of their life, and to a lesser degree those wildlife that transit through these areas. Under Alternative 3, ONMS also proposes to pilot limited-use zones to inform sanctuary management of concentrated and high levels of use and potential or associated natural resource impacts from that use.

The impacts to biological resources from changes to marine zone boundaries and regulations proposed under Alternative 3 are generally the same as Alternative 2 (as described in Section 5.4.1.3), except for some additional impacts unique to changes to WMAs and SPAs proposed under Alternative 3. There would be no additional impacts to biological resources specific to the proposed conservation area zones, management areas, national wildlife refuges, and associated regulations under Alternative 3. The discussion of impacts below is divided into two marine zone types: (1) wildlife management areas, and (2) sanctuary preservation areas.

Proposed marine zone modification: Wildlife management areas

There are 28 wildlife management areas (WMAs) in the current FKNMS. Under Alternative 3, ONMS would revise the boundaries of some existing WMAs and create 32 new WMAs. In Alternative 3, ONMS would also implement access restrictions in each WMA, including idle speed/no-wake, no-motor, no-anchor, and a greater number of no-entry zones compared to Alternative 2. By modifying access restrictions, ONMS aims to address impacts to benthic habitats from prop scarring, anchor damage, and impacts to wildlife species including flushing nesting and roosting birds. The general impacts to biological resources of modifications to WMAs proposed under Alternative 3 are the same as Alternative 2 (described in Section 5.4.1.3).

Beneficial impacts: Under Alternative 3, a WMA would be created that would protect additional seagrass habitat (described below).

Alternative 3 would also include several changes to zone-specific regulations/access restrictions that would be more protective than those proposed under Alternative 2 and would therefore result in a greater **direct beneficial** impact for habitats included in those marine zones. Under Alternative 3, more WMAs would have no-entry restrictions. The greater number of no-entry zones included in Alternative 3 would provide enhanced overall protections to these areas from vessel impacts and wildlife disturbance that could result in potential behavior change, including bird flushing and/or foraging habitat and nesting abandonment. The proposed WMAs and zone-specific regulations under Alternative 3 would result in a **direct, beneficial, less than significant** effect for the habitats and wildlife dependent on those habitats within the marine zone. A selection of modified or new WMAs proposed in Alternative 3 are described below to provide specific examples of the additional **direct beneficial** impacts to habitat and wildlife associated with implementing this alternative:

New Key Lois and Loggerhead Basin WMA: Under Alternative 3, ONMS would create a new speed-restricted WMA at Key Lois and Loggerhead Basin. This action would provide **direct beneficial** impact to prop-scar-impacted seagrass and wildlife, particularly tarpon during their winter-spring migration, by reducing the risk of human disturbance of this habitat from vessel activity.

Modified and new WMAs in the Florida Keys National Wildlife Refuge Complex: Under Alternative 3, ONMS would create several new or modify existing WMA zones in the Florida Keys National Wildlife Refuge Complex. These zones would have increased access restrictions: the idle speed/no-wake restriction would be changed to a no-motor restriction, and more no-entry WMAs would be included. These increased access restrictions would have **direct beneficial** impacts to mangrove habitat, shallow-water habitat, and important bird species by creating a 100-yard buffer around select mangrove islands with critical nesting, roosting, and/or foraging areas to minimize disturbance. By further minimizing disturbance of these areas compared to Alternative 2, these proposed marine zones with increased access restrictions would provide a greater **direct beneficial significant** impact to 13 species of nesting and roosting birds listed by the state as threatened on mangrove island, intratidal, and beach berm habitats adjacent to the zones.

Adverse impacts: As described under impacts from Alternative 2 in Section 5.4.1.3, **no adverse impacts** to biological resources are expected from the proposed modified or new WMAs and associated access restrictions.

Proposed marine zone modification: Sanctuary preservation areas

There are 19 SPAs in the current FKNMS. Under Alternative 3, ONMS would revise the boundaries of some existing SPAs and create seven new SPAs (one more than is included in Alternative 2). Alternative 3 would include implementation of a pilot program to create limited-use areas at three SPAs (Carysfort, Sombrero, and Sand Key). All other proposed regulations included in Alternative 2 would apply. The general impacts to biological resources of modifications to SPAs proposed under Alternative 3 are the same as Alternative 2 (described in Section 5.4.1.3).

Beneficial impacts: In Alternative 3, the proposed SPAs would have a **direct beneficial** effect on habitats that would be added to existing marine zones or would be protected through proposed new zones. Additional habitat types targeted for protection through Alternative 3 would include patch reefs and deeper coral reef habitats; high-relief, resilient, or ESA-listed coral species; and ecological features that are known to support fish aggregations. A selection of modified or new SPAs proposed in Alternative 3 are described below to provide specific examples of the additional **direct beneficial** impacts to habitat and wildlife associated with implementing this alternative:

New Long Key Tennessee Reef SPA: Under Alternative 3, ONMS would create a new SPA adjacent to Long Key State Park and extending to the deep reef at Tennessee Reef. This new SPA would protect large, contiguous, interconnected seagrass, shallow hardbottom, aggregate patch reef, and deep, drowned spur-and-groove reef habitats. This SPA would also provide a corridor for migration of different life stages of fishes from Florida Bay into the Middle Keys. Protection of this area and application of existing and proposed new SPA regulations (described in Section 5.4.1.3) would have a **direct beneficial** impact on the habitats and associated wildlife in this area by avoiding potential adverse impacts to biological resources associated with human use of this area, including anchoring.

Limited-use area pilot program: Implementation of a pilot limited-use program at three SPAs (Carysfort, Sombrero, and Sand Key) would provide **direct beneficial** impact to resources in these areas from a decreased level of concentrated and overall use. Easy access to recreational sites in the Florida Keys has increased the burden on numerous habitats and the species with which they are associated. Implementing the limited-use SPAs proposed in this alternative would also provide **indirect beneficial** impacts to biological resources by increasing the information available to assess carrying capacity in sensitive areas and associated wildlife disturbances, impacts to species diversity, abundance, and distribution, and direct impacts of overuse.

Adverse impacts: As described in Section 5.4.1.3, **no adverse impacts** to biological resources are expected from the proposed modified or new SPAs and pilot program for limited use areas.

5.5.1.4 Impacts to biological resources from updates to the FKNMS management plan (Alternative 3)

The impacts to biological resources from the proposed management plan under Alternative 3 would be the same as the impacts under Alternative 2 (as described in Section 5.4.1.4) because the proposed management plan would be the same under alternatives 2 and 3.

5.5.2 Impacts to physical resources (Alternative 3)

The impacts to physical resources from changes to the sanctuary boundary, sanctuary-wide regulations, marine zone boundaries and regulations, and the FKNMS management plan proposed under Alternative 3 would be the same impacts as those described under Alternative 2 (as described in Section 5.4.2) given that these components of the alternatives would result in the same impacts to physical resources under alternatives 2 and 3.

5.5.3 Impacts to cultural and historical resources (Alternative 3)

The impacts to cultural and historical resources from changes to the sanctuary boundary, sanctuary-wide regulations, marine zone boundaries and regulations, and the FKNMS management plan proposed under Alternative 3 would be the same impacts as those described under Alternative 2 (as described in Section 5.4.3) given that these components of the alternatives would result in the same impacts to physical resources for alternatives 2 and 3.

5.5.4 Impacts to socioeconomic resources and human uses (Alternative 3)

This section describes the impacts to socioeconomic resources and human uses that would occur under Alternative 3.

5.5.4.1 Impacts to socioeconomic resources and human uses from changes to the sanctuary boundary (Alternative 3)

The impacts to socioeconomic resources and human uses from the proposed sanctuary boundary expansion under Alternative 3 would be the same as the impacts under Alternative 2 (as described in Section 5.4.4.1) because the proposed boundary expansion would be the same under alternatives 2 and 3.

5.5.4.2 Impacts to socioeconomic resources and human uses from changes to sanctuary-wide regulations (Alternative 3)

The impacts to socioeconomic resources and human uses from changes to sanctuary-wide regulations would be the same as for those under Alternative 2 (as described in Section 5.4.4.2) because the proposed sanctuary-wide regulations would be the same under alternatives 2 and 3.

5.5.4.3 Impacts to socioeconomic resources and human uses from revisions to marine zone boundaries and regulations (Alternative 3)

Alternative 3 would expand the total number of marine zones from 57 zones in the no action alternative (Alternative 1) to 98 zones in Alternative 3. This change would result in a 10.45 percent increase in the amount of habitat that would be protected by the sanctuary. This percentage of additional habitat protection in zones is important because it is used to scale the potential benefits to non-consumptive recreation for zoned areas that would displace consumptive users (e.g., SPAs and CAs). In other words, the zones will result in displacement of some consumptive users, but as the habitat improves, so too would the quality and quantity of scuba and snorkeling opportunities. Consequently, non-consumptive recreation in these areas is likely to increase with the habitat improvements.

Socioeconomic impacts are largely the same for alternatives 2 and 3. See Section 5.4.4.3 for detailed analysis.

Beneficial impacts: Adding more restrictive marine zones that limit human use and recreational activities would provide areas for fish, whales, sea turtles, and other aquatic biota to forage, breed, and tend to young without the adverse impacts associated with fishing, recreational activities, and other human uses. These restricted areas often lead to increased population health and growth for fish and other aquatic biota. As described in Section 5.4.4.3, migration from restricted-access areas to non-restricted areas can lead to replenishment or increased densities within the non-restricted areas.

Leeworthy et al. (2019) quantified the benefit to the tourism industry by estimating the increased recreational activity, assuming that a larger, healthy ecosystem would attract more recreational tourists to the sanctuary. Alternative 3 would protect slightly more area than Alternative 2, and therefore, would have slightly higher potential benefits than Alternative 2, with an increase of 235,000 person-days of non-consumptive recreation activity (an increase of slightly more than 10 percent in activity) and an associated annual value estimated at over \$15.3 million.

In addition to the non-market economic value in potential benefits, the increase in activity facilitated by this alternative would have potential benefits in increased spending in the Monroe County economy and the associated economic impacts on output, income, and the number of full- and part-time jobs. These indirect benefits would be slightly higher for Alternative 3 than Alternative 2. Leeworthy et al. (2019) estimated that implementing the marine zones and regulations would have the following potential benefits:

- Additional expenditures: \$34.1 million in additional annual spending associated with non-consumptive recreation, including scuba, snorkeling, and wildlife viewing tours; hotels; food; car rentals, etc.
- These expenditures/spending (associated with non-consumptive recreation) within Monroe County could lead to an increase of approximately:
 - \$38.2 million in output, which measures the total value of the production of goods and services (those items consumers are purchasing and what businesses need to have/purchase to support those consumer needs) supported by the consumer expenditures and is equal to the sum of all intermediate sales (business to business sales) and final sales (sales from businesses to consumers);
 - \$16.7 million in income, which is the total value paid to workers and includes employee compensation and proprietor income; and
 - 472 full- and part-time jobs.

Therefore, the revisions to the marine zone boundaries and regulations under Alternative 3 would likely result in **long-term, direct, less than significant beneficial** impacts to the water-based recreational tourism industry and commercial fishermen. In the long term, these beneficial impacts associated with increased biota and fishing stocks outside the restricted areas may be larger than the costs associated with the loss of area for fishing (as described below). In this case, the overall impact would be net-beneficial to the Monroe County economy.

In addition, replenishment would also result in **indirect negligible benefits** to the local tourism industry due to the increase in visitors to the region and concomitant spending within Monroe County.

Adverse impacts: Adverse impacts could result due to increased cost to fishermen and lost area for recreational users. Due to the overall similarities to Alternative 2 and the likelihood that fishermen would be able to relocate and fish within non-restricted areas, the cost estimates would be the same as those described for Alternative 2 in Section 5.4.4.3, and result in **less than significant adverse** impacts.

5.5.4.4 Impacts to socioeconomic resources and human uses from updates to the FKNMS management plan (Alternative 3)

The impacts to socioeconomic resources and human uses from changes to the FKNMS management plan would be the same as for those under Alternative 2 (as described in Section 5.4.4.4) because the management plan would be the same under alternatives 2 and 3.

5.6 Impacts specific to Alternative 4

This section describes the beneficial and adverse impacts of (1) boundary expansion, (2) updated and new sanctuary-wide regulations, (3) marine zone boundary and regulatory changes, and (4) a new management plan. Alternative 4 includes many of the same components as Alternative 3. Specifically, Alternative 4 would include the following:

Sanctuary boundary expansions:

- The same boundary as Alternative 2, with the addition of Pulley Ridge.

Revised and new sanctuary-wide regulations:

- The same proposed new and revised sanctuary-wide regulations as Alternative 2.
- Update to live rock aquaculture activities to provide additional sanctuary oversight.
- Update to the shoreline slow speed zone regulation at 15 CFR § 922.163(a)(5)(iii)(D).

Marine zone boundary and regulatory changes:

- Expand the total number of marine zones from 57 zones to 98 zones (the same number of marine zones as Alternative 3).
- More protective marine zone regulations and access restrictions than would be implemented in alternatives 2 and 3.
- Combine some marine zones and include larger zones in each of the five geographic regions to protect large areas of contiguous habitats.

Updated management plan:

- The same management plan as alternatives 2 and 3. (For the draft management plan text, see Section 3.5).

Impacts from Alternative 4 include:

- Impacts common to all alternatives (see Section 5.2);
- Several of the same impacts as Alternative 3, as specified below; and
- Impacts specific to Alternative 4, as described below.

5.6.1 Impacts to biological resources (Alternative 4)

This section describes the impacts to habitats and wildlife that would occur under Alternative 4.

5.6.1.1 Impacts to biological resources from the proposed sanctuary boundary (Alternative 4)

The **beneficial** and **adverse** impacts to biological resources from changes to the sanctuary boundary proposed under Alternative 4 are the same as Alternative 2 (as described in Section 5.4.1.1) and Alternative 3, except for the additional benefits of inclusion of the Pulley Ridge expansion area.

Pulley Ridge has demonstrated connectivity with the Florida Keys as shown through ocean current speed and direction studies and genetic analyses of species in Pulley Ridge, the Dry Tortugas, and the wider Florida Keys region. This proposed boundary expansion is aligned with an existing and proposed update to a Gulf of Mexico Fishery Management Council (GMFMC) habitat area of particular concern (HAPC). This boundary expansion would provide additional protections to unique mesophotic coral reefs and other endemic species found only in this region. Protecting the resources of Pulley Ridge through expansion of FKNMS would provide **direct benefits** to the mesophotic reef and hardbottom habitats present at Pulley Ridge. This action could also provide **long-term indirect benefits** to the habitats and species of the Florida Keys by serving as a source of fish and coral larvae and specifically as a source for resilient coral reef species. Under Alternative 4, ONMS would also implement a no-anchor regulation at Pulley Ridge, which would provide **direct, beneficial, less than significant** impacts to benthic habitats and associated wildlife.

5.6.1.2 Impacts to biological resources from additions and revisions to sanctuary-wide regulations (Alternative 4)

The **beneficial** and **adverse** impacts to biological resources from changes to sanctuary-wide regulations proposed under Alternative 4 are the same as Alternative 3 (as described in Section 5.5.1.2), except for the additional impacts of the proposed sanctuary authorization for live rock aquaculture activities and shoreline slow speed zones.

Proposed sanctuary-wide regulation update: Coral and live rock prohibition

Under Alternative 4, ONMS would require a sanctuary authorization to conduct live rock aquaculture activities in sanctuary waters. An authorization is a type of approval, similar to a permit, which allows activities under another agency's permit to occur in the sanctuary. With authorizations, ONMS is able to add conditions to ensure that sanctuary resources are protected during the conduct of the activity.

Authorizations would be issued for the existing submerged lands lease issued by Florida Department of Agriculture and Consumer Services for live rock aquaculture in state waters and the existing NMFS permit for live rock aquaculture in federal waters of the sanctuary.

Beneficial impacts: Requiring sanctuary authorization for this activity would have both **direct** and **indirect beneficial** impacts for biological resources within FKNMS. Under its authorization, ONMS would be able to add conditions currently not addressed in state or federal permits that would further protect sanctuary resources, such as requiring that aquaculture material not be moved between areas to reduce potential spread of pathogens or disease. Similarly, conditions would be applied for notification to FKNMS if aquaculture materials were dispersed or disturbed from storms, which would ensure the

indirect protection of associated habitat and wildlife present in these areas. Requiring notification to FKNMS law enforcement during rock harvest or deposition would have indirect beneficial impacts to wildlife and habitats if it reduces the chance of illegal poaching of wild (non-aquaculture) live rock.

Adverse impacts: Requiring authorization of live rock aquaculture activities would serve to further protect wildlife and habitats from adverse impacts associated with live rock aquaculture. ONMS does not expect that implementing this regulatory change would increase the amount of live rock aquaculture activities that take place in FKNMS or the expanded areas in a manner that would cause adverse impacts to biological resources. **No adverse impacts** to biological resources are expected from amending the sanctuary regulations to require FKNMS authorization of permitted live rock aquaculture activities.

Proposed sanctuary-wide regulation update: Shoreline slow speed zone

Under Alternative 4, ONMS would revise the sanctuary-wide regulation at 15 CFR § 922.163(a)(5)(iii)(D) to require that motorized vessels operate at slow speeds within 100 yards along all shorelines in the existing and expanded sanctuary.

Beneficial impacts: This proposed regulatory change would have a **direct beneficial** impact to habitats located along the shoreline, near shore, and in shallow water, as well as wildlife that inhabit or forage in these areas, by reducing adverse impacts associated with disturbance from vessel use.

Adverse impacts: The proposed regulation is intended to reduce wildlife disturbance and disturbance or destruction of shoreline, nearshore, and shallow-water habitat. ONMS does not expect that this regulatory change would change the intensity or location of vessel activity within FKNMS in a way that would cause adverse impacts to biological resources. **No adverse impacts** to biological resources are expected from this proposed regulation to limit vessel speeds within 100 yards of all shorelines in the sanctuary.

5.6.1.3 Impacts to biological resources from revisions to marine zone boundaries and regulations (Alternative 4)

Under Alternative 4, ONMS would modify existing marine zones and create new marine zones to provide additional protection for specific habitat types, for habitat areas that are heavily impacted by human use, and for wildlife associated with these habitats. ONMS would also revise regulations governing uses of individual marine zones. See Section 3.6 for details on the individual marine zones, and Section 3.3 for a summary of access restrictions in the marine zones.

The marine zone scheme proposed in Alternative 4 would create targeted and larger continuous zones and apply the most protective regulatory restrictions. The access restrictions would still be aligned with and dependent upon the resource protection goals of the marine zone type and the individual marine zone. To do this, some marine zones would be combined and larger marine zones would be included in each of the five geographic regions (Upper Keys, Middle Keys, Lower Keys, Marquesas, and Tortugas). The proposed marine-zone-specific regulations and access restrictions would be more restrictive in Alternative 4 than in the other proposed alternatives.

The impacts to biological resources from changes to marine zone boundaries and regulations proposed under Alternative 4 are generally the same as Alternative 3 (as described in Section 5.5.1.3), except for some additional impacts unique to changes to WMAs, SPAs, and conservation areas proposed under Alternative 4. There would be no additional impacts to biological resources specific to the proposed

management areas, national wildlife refuges, and associated regulations under Alternative 4. The discussion of impacts below is divided into three marine zone types: (1) wildlife management areas, (2) sanctuary preservation areas, and (3) conservation areas.

Proposed marine zone modification: Wildlife management areas

There are 28 WMAs in the current FKNMS. Under Alternative 4, ONMS would revise the boundaries of some existing WMAs and create 31 new WMAs. Alternative 4 would maintain most of the zone-specific WMA regulations and access restrictions proposed in Alternative 3 with only a few proposed increased access restrictions that are intended to provide further protection for habitats and associated wildlife. The majority of WMAs in Alternative 4 would have small spatial changes, including a straight line configuration rather than a contour around the islands for WMAs in the Florida Keys National Wildlife Refuge Complex. This design is primarily proposed to facilitate marking of these zones and subsequently support compliance and enforcement of these zones and regulations. The general impacts to biological resources of modifications to WMAs proposed under Alternative 4 are the same as alternatives 2 and 3 (described in sections 5.4.1.3 and 5.5.1.3).

Beneficial impacts: In Alternative 4, additional habitat area would be included through expansion of existing WMAs and through the one proposed new zone at Content Keys and Upper Harbor Key. This proposed marine zone would protect a larger area of habitat, therefore providing **direct beneficial** impacts to habitat and wildlife through expanding protections and access restrictions to these new zones. Alternative 4 would propose increased access restrictions in some WMAs that would provide further protection and greater **direct beneficial** impacts for these habitats and wildlife that inhabit, forage, or transit through these WMAs. The proposed marine zones would provide some additional **direct beneficial** impacts to shallow water habitats and associated wildlife species. However, these impacts would be negligible because the area of the zones would be a similar size under alternatives 3 and 4. A selection of modified or new WMAs proposed in Alternative 4 are described below to provide specific examples of the **direct beneficial** impacts to habitat and wildlife associated with implementing this alternative:

Modified and new WMAs in the Florida Keys Wildlife Refuge Complex: As described above, under Alternative 4, several proposed new WMA zones included in the Florida Keys Wildlife Refuge Complex would have changes to the spatial area protected to facilitate placement of marker buoys and user compliance and enforcement. This action would create additional buffer areas for the targeted habitats and wildlife species which would result in additional **direct beneficial impacts**. However, the increase would be **negligible** because of the minor change in size of the buffer areas.

New Content Keys and Upper Harbor Key WMA: Under Alternative 4, ONMS would create new marine zones at Content Keys and Upper Harbor Key which would provide **direct beneficial** impacts to seagrass and hardbottom habitat in this area by reducing the potential for prop scarring due to human use of these areas. Implementation of speed restrictions in these zones would also provide **direct beneficial** impacts to the wildlife using this area, in particular the most heavily-used foraging area for great white heron in the Lower Florida Keys.

Adverse impacts: As described in Section 5.4.1.3, **no adverse impacts** to biological resources are expected from the proposed modified or new WMAs and associated access restrictions. The potential

adverse impacts to biological resources associated with placement of marker buoys and enforcement activities are described in Table 5.2.

Proposed marine zone modification: Sanctuary preservation areas

There are 19 SPAs in the current FKNMS. Under Alternative 4, ONMS would revise the boundaries of some existing SPAs and create three new SPAs. Alternative 4 would include implementation of a pilot program to create limited-use areas at two SPAs (Sombrero and Sand Key). All other proposed regulations included in Alternative 2 would apply (see sections 3.3 and 3.4). The general impacts to biological resources of modifications to SPAs proposed under Alternative 4 are the same as alternatives 2 and 3 (described in sections 5.4.1.3 and 5.5.1.3). The general impacts to biological resources of implementation of a pilot program for limited use areas proposed under Alternative 4 are the same as Alternative 3, with the exception that this proposal would not apply in the Carysfort SPA in Alternative 4.

Beneficial impacts: In Alternative 4, the proposed modified existing and proposed new SPAs would have a **direct beneficial** impact on habitats that are added to existing marine zones or would be protected through proposed new zones. There would be no additional habitat types targeted for protection in SPAs in Alternative 4 other than those protected in other alternatives. However, additional areas that encompass these habitats would be included in Alternative 4 (e.g., Carysfort SPA). Under Alternative 4, ONMS would change the shape of four existing SPAs to be straight-lined marine zones. This change would make the marking of these zones clearer to facilitate enforcement and compliance with regulations applied in these areas. This would have a **negligible** impact to habitats and associated wildlife within these zones because the change in the size of the zone would be minor. A selection of modified or new SPAs proposed in Alternative 4 are described below to provide specific examples of the additional **direct beneficial** impacts to habitat and wildlife associated with implementing this alternative:

New Snapper Ledge SPA: Under Alternative 4, ONMS would create a new SPA at Snapper Ledge to protect ESA-listed coral species. This action would provide **direct beneficial** impacts to ESA-listed coral species by expanding protections and access restrictions to address existing user conflicts known to occur at this site.

Expanding Carysfort SPA: Under Alternative 4, ONMS would modify the existing Carysfort SPA to extend the zone to the shoreline to encompass and protect large, contiguous interconnected seagrass, shallow hardbottom, aggregate patch reef, and deep, drowned spur-and-groove reef habitats, and to provide a corridor for migration of fishes at different life stages. Protection of this area and application of existing and proposed new SPA regulations would have a **direct beneficial** impact on the habitats and associated wildlife in this area by avoiding the potential adverse impacts to biological resources associated with human use of this area, including anchoring.

Adverse impacts: As described in Section 5.4.1.3, **no adverse impacts** to biological resources are expected from the proposed modified or new SPAs.

Proposed marine zone modification: Conservation areas

Under Alternative 4, ONMS would adopt “conservation area” as a new marine zone type that will take the place of the existing special use area and ecological reserve zones. There are currently four special use areas and two ecological reserves in FKNMS. Under Alternative 4, ONMS would create 13 conservation

areas. The proposed transit-only regulation for conservation areas included in Alternative 2 would apply. Alternative 4 would have the greatest number and area of conservation areas.

Beneficial impacts: The general **direct beneficial** impacts to biological resources of creating conservation areas proposed under Alternative 4 are the same as Alternative 2 (described in Section 5.4.1.3), except that these direct beneficial impacts would be spread over a larger area through additional protections and application of transit-only regulations to more conservation areas. Several of the areas included as conservation areas in Alternative 4, including Tortugas Corridor, Marquesas Keys turtle area, Western Dry Rocks, Turtle Shoal, Long Key Tennessee Reef, and El Radobob Key, are included in other alternatives but as a different zone types with less restrictive regulations. By zoning these areas as conservation areas, Alternative 4 would provide greater **direct beneficial** impacts to fish spawning aggregations, seagrass habitat critical to foraging green sea turtles, patch reefs, interconnected habitats, and targeted seagrass and hardbottom habitats, and associated wildlife.

Adverse impacts: As described in Section 5.4.1.3, **no adverse impacts** to biological resources are expected from the proposed modified or new conservation areas.

5.6.1.4 Impacts to biological resources from updates to the FKNMS management plan (Alternative 4)

The impacts to biological resources from the proposed management plan would be the same as for those under Alternatives 2 (as described in Section 5.4.1) because the proposed management plan would be the same under alternatives 2, 3, and 4.

5.6.2 Impacts to physical resources (Alternative 4)

This section describes the impacts to physical resources that would occur under Alternative 4.

5.6.2.1 Impacts to physical resources from the proposed sanctuary boundary expansion (Alternative 4)

The impacts to physical resources from changes to the sanctuary boundary proposed under Alternative 4 are the same as Alternative 2 (as described in Section 5.4.2.1), except for the additional benefits of inclusion of the Pulley Ridge expansion area. The proposed boundary expansion to include Pulley Ridge acknowledges and aims to take advantage of oceanographic currents to provide long-term benefits and protection of resources. Specifically, protecting the habitats and ecosystem of Pulley Ridge could have **direct long-term beneficial impacts** for downstream habitats, species, and ecosystems in the Florida Keys, as there is demonstrated connectivity between Pulley Ridge and the Florida Keys via the loop and Florida current. This beneficial impact would be **less than significant**.

5.6.2.2 Impacts to physical resources from changes to sanctuary-wide regulations (Alternative 4)

The impacts to physical resources from changes to sanctuary-wide regulations proposed under Alternative 4 are the same as Alternative 2 (as described in Section 5.4.2.2).

5.6.2.3 Impacts to physical resources from revisions to marine zone boundaries and regulations (Alternative 4)

The impacts to physical resources from changes to marine zone boundaries and regulations proposed under Alternative 4 are the same as Alternative 2 (as described in Section 5.4.2.2).

5.6.2.4 Impacts to physical resources from updates to the FKNMS management plan (Alternative 4)

The impacts to physical resources from changes to the FKNMS management plan proposed under Alternative 4 would be the same as that described for Alternative 2 (as described in Section 5.4.2.4) because the proposed management plan would be the same under alternatives 2, 3, and 4.

5.6.3 Impacts to cultural and historical resources (Alternative 4)

The impacts to cultural and historical resources from changes to the sanctuary boundary, sanctuary-wide regulations, marine zone boundaries and regulations, and FKNMS management plan proposed under Alternative 4 would be the same as Alternative 2 (as described in Section 5.4.3) because the differences in alternative components between alternatives 2 and 4 would not have any indirect or direct impacts on cultural or historical resources beyond those discussed for impact common to all alternatives. However, if additional cultural and historical resources are located in Pulley Ridge, such resources would benefit from the sanctuary regulations that would apply to protect them.

5.6.4 Impacts to socioeconomic resources and human uses (Alternative 4)

This section describes the impacts to socioeconomic resources and human uses that would occur under Alternative 4.

5.6.4.1 Impacts to socioeconomic resources and human uses from changes to the sanctuary boundary (Alternative 4)

The impacts to socioeconomic resources and human uses from changes to the sanctuary boundary proposed under Alternative 4 are the same as under Alternative 2 (as described in Section 5.6.4.1), except for the additional impacts from including the Pulley Ridge expansion area.

Beneficial impacts: Benefits from proposed boundary expansion are the same as Alternative 2, applied over a larger geographic area. Alternative 4 would include the same sanctuary boundary expansions as alternatives 2 and 3, but would also include the expansion to include Pulley Ridge. Currently, there is limited recreational use of Pulley Ridge. Therefore, the **direct benefits** of coral reef protections for recreational use would be expected to be minor in the short-term. Over the long-term, more recreational “for hire” fishing and diving operations could develop using these resources and thus generate future benefits. Some people may visit Pulley Ridge, increasing the recreational use in this area. The greatest benefit would likely be from nonuse or passive economic use value such as increasing opportunities for research and education activities. These passive economic benefits would be the same as those described in Section 5.4.4.1, but spread over a greater area within the Pulley Ridge area. As described in Section 5.4.4.1, these benefits would be **less than significant**.

Adverse impacts: Currently, the National Marine Fisheries Service regulations in the existing habitat area of particular concern (Pulley Ridge South) prohibit bottom tending fishing gear and anchoring by fishing vessels. As such, the proposed sanctuary boundary expansion, application of the sanctuary wide regulations, and application of a proposed no-anchor regulation in Pulley Ridge would result in **direct adverse** impacts that would be **less than significant**. The National Marine Fisheries Service is currently proposing to expand the Pulley Ridge HAPC (Pulley Ridge South Portion A), which would have the same regulations as the existing habitat area of particular concern, thereby restricting bottom tending fishing gear and anchoring by fishing vessels. However, the National Marine Fisheries Service regulations would not include a restriction on bottom longlining in Pulley Ridge South Portion A.

Therefore, in the area proposed for FKNMS boundary expansion (which would mirror the National Marine Fisheries Service proposed expansion to include both the Pulley Ridge South and South Portion A, see Figure 4.8), the **adverse** impacts to fishing activity would be **less than significant**, assuming the National Marine Fisheries Service moves forward with its proposed expansion. The primary adverse impact from expanding the proposed sanctuary would be an increase in NOAA's administrative and enforcement costs in order to manage the expanded areas of the sanctuary. These costs would include those currently expended to operate and manage the current sanctuary, as described in Section 5.2.1, as well as the minimal additional cost to operate and manage the proposed expansion area. The net increase in costs would be **less than significant** because the sanctuary would be conducting the same activities as those described in Section 5.2.1, but over a slightly larger area. Therefore, expanding the sanctuary would result in **less than significant direct adverse impacts**.

5.6.4.2 Impacts to socioeconomic resources and human uses from changes to sanctuary-wide regulations (Alternative 4)

The impacts to socioeconomic resources and human uses from changes to sanctuary-wide regulations proposed under Alternative 4 are the same as Alternative 2 (as described in Section 5.4.4.2), except for the additional impacts of the proposed sanctuary-wide regulatory changes related to coral and live rock prohibitions and shoreline slow speed zones.

Proposed sanctuary-wide regulation update: Coral and live rock prohibition

Alternative 4 would require sanctuary authorization for existing and future live rock aquaculture activities that occur within FKNMS.

Beneficial impacts: The benefits of requiring a sanctuary authorization for existing and future live rock aquaculture activities in FKNMS would be largely administrative, except that enforcement and the avoidance of illegal poaching would be a **direct benefit** to the industry in both the short and long-term. These impacts would be **negligible**.

Adverse impacts: The proposed regulatory change would result in minimal costs to permittees in terms of time because the application(s) permittees use to apply for state or federal live rock aquaculture purposes could be used to apply for the FKNMS authorization, with the addition of a small amount of supplemental information. This **direct adverse** impact would be **negligible** given the supplemental application information should take less than four hours to complete.

Proposed sanctuary-wide regulation update: Shoreline slow speed zone

Alternative 4 would extend this existing prohibition to apply to all shorelines within the sanctuary.

Beneficial impacts: The benefits to human users of FKNMS of slow speeds close to shore would include enhanced boating safety, shoreline erosion protection, avoidance of property damage, lower disturbance to wildlife, and sometimes avoidance of strikes to manatees. These impacts would be **direct and less than significant**.

Adverse impacts: The main adverse impacts from the proposed regulation of shoreline speeds would be the added time for boat operators to drive a slower speed and enforcement costs for the sanctuary or other resource protection agency to ensure boaters comply with the slow speed restrictions.

5.6.4.3 Impacts to socioeconomic resources and human uses from changes to marine zone boundaries and regulations (Alternative 4)

Alternative 4 would expand the total number of marine zones from 57 areas (no action alternative) to 98 areas. This change would result in a 44.24 percent increase in the amount of habitat that would be protected by the sanctuary. This percentage of additional habitat protection is important because it is used to scale the potential benefits to non-consumptive recreation (e.g., scuba diving, snorkeling, wildlife viewing) for zoned areas that would displace consumptive users (e.g., SPAs and conservation areas that would prohibit fishing). In other words, the zones would result in displacement of some consumptive users, such as fishermen, but as the habitat improves and fish populations increase within the restricted areas, so too would the quality and quantity of scuba and snorkeling opportunities. Consequently, non-consumptive recreation in these areas is likely to increase with the habitat improvements.

Socioeconomic impacts of Alternative 4, particularly for commercial and recreational fisheries, are higher than alternatives 2 and 3, as this alternative includes the largest amount of habitat area protected through marine zones. For information on the analysis method see Section 5.1.1. For comparison of impacts across the alternatives, see Section 5.7.

Beneficial impacts: Adding more restrictive marine zones that limit human use and recreational activities within certain areas would provide places for fish, whales, sea turtles, and other aquatic biota to forage, breed, and tend to young without the adverse impacts associated with fishing, recreational activities, and other human uses. These restricted areas often lead to increased population health and growth for fish and other aquatic biota. As described in Section 5.4.4.3, migration from restricted-access areas to non-restricted areas can lead to replenishment or increased densities within the non-restricted areas.

Leeworthy et al. (2019) quantified the benefit to the tourism industry by estimating the increased recreational activity, assuming that a larger, healthy ecosystem would attract more recreational tourists to the sanctuary. Alternative 4 would protect more area than Alternative 3, and therefore would have a higher potential benefit than Alternative 3. Specifically, Alternative 4 would result in an estimated increase of over one million person-days of non-consumptive recreation activity (an increase of about 44 percent in activity) valued at over \$68.3 million annually.

In addition to the non-market economic value in potential benefits, the increase in activity supported would have potential benefits in increased spending in the Monroe County economy and the associated economic impacts on output, income, and the number of full- and part-time jobs. Leeworthy et al. (2019)

estimated that implementing the marine zones and regulations would have the following annual potential benefits:

- Additional expenditures: \$144.4 million in additional spending on goods and services associated with non-consumptive recreation, including scuba, snorkeling, and wildlife viewing tours; hotels; food; car rentals, etc.
- These expenditures/spending (associated with non-consumptive recreation) within Monroe County could lead to an increase of approximately:
 - \$161.7 million in output, which measures the total value of the production of goods and services supported by the consumer expenditures and is equal to the sum of all intermediate sales (business to business sales) and final sales (sales from businesses to consumers);
 - \$70.9 million in income, which is the total value paid to workers and includes employee compensation and proprietor income; and
 - Nearly 2,000 full- and part-time jobs.

Therefore, the revisions to the marine zone boundaries and regulations under Alternative 4 would likely result in **long-term, direct, less than significant beneficial** impacts to the water-based recreational tourism industry and commercial fishermen. In the long term, these beneficial impacts associated with increased biota and fishing stocks outside the restricted areas may be larger than the costs associated with the loss of area for fishing (as described below). In this case, the overall impact would be net-beneficial to the Monroe County economy.

In addition, replenishment would also result in **indirect less than significant benefits** to the local tourism industry due to the increase in visitors to the region and associated spending within Monroe County.

Adverse impacts: Adverse impacts could result due to the area lost for recreational users and fishermen. In terms of lost revenue to potentially affected fishermen, Alternative 4 would result in \$814,000 of lost revenue, or 1.38 percent of all commercial fishing revenue in FKNMS. Alternative 4 would have the greatest potential impact with a cost of \$1,464,208 in output, \$907,809 in income, and 22 jobs. These **adverse impacts** would be **less than significant** because the lost revenue, output, and jobs would be a very small percent of the overall revenue, output, and jobs provided by the commercial fishing industry within the Florida Keys.

For recreational users, the area restrictions would result in an estimated loss of 85,341 person-days annually for which users would otherwise have conducted recreational activities within the sanctuary. Since many recreational users would have paid tour companies or boat operators to access the sanctuary, the closures would also result in a potential loss in spending of \$14.1 million annually. Furthermore, the loss in spending would have potential adverse effects in terms of decreased spending in the Monroe County economy and the associated economic impacts on output, income, and the number of full- and part-time jobs. This loss in direct spending would be associated with a loss of about \$15.8 million in output, \$7.3 million in income, and 202 full- and part-time jobs within the local economy. These **adverse impacts** would be **less than significant** because the lost revenue, output, and jobs would be a very small percent of the overall revenue, output, and revenue provided by the tourism industry within the Florida Keys.

5.6.4.4 Impacts from socioeconomic resources and human uses from updates to the FKNMS management plan (Alternative 4).

The impacts to socioeconomic resources and human uses from changes to the FKNMS management plan proposed under Alternative 4 would be the same as Alternative 2 (as described in Section 5.4.4.4).

5.7 Comparison of impacts across alternatives

This section presents a comparison of the overall potential environmental and socioeconomic impacts of the proposed action and alternatives. Sections 5.1 through 5.6 address the individual impacts associated with each alternative by topic. The alternatives, as described in Chapter 3, include the no action alternative (Alternative 1) and a range of three progressively more protective alternatives. Alternative 3 is NOAA's preferred alternative. Alternatives that were eliminated from further evaluation are listed in Section 3.7.

Alternative 2 aims for greater overall protection than the no action alternative (Table 5.3). This would primarily be achieved through changes to the number and configuration of marine zones and the access restrictions/regulations proposed for the marine zones. Overall, Alternative 2 would include an additional 9.29 percent of zoned area than that within the current sanctuary boundary (Table 5.4). Additionally, Alternative 2 would result in an increase of approximately 421 jobs in the Florida Keys region (Table 5.5).

Alternative 3 aims for greater overall protection than Alternative 2 by updating one sanctuary-wide regulation, adding two additional marine zones, and implementing more protective marine zone regulations and access restrictions than Alternative 2. Overall, Alternative 3 would include an additional 10.45 percent of zoned area than that within the current sanctuary boundary and would implement more protective access restrictions than those proposed in Alternative 2 in order to meet greater environmental protection goals (Table 5.4). Alternative 3 places greater emphasis on resource protection over allowing a high level of use. Alternative 3 also presents economic benefits relative to Alternative 2, whereby all metrics for benefits would increase and metrics for adverse impacts would remain the same between alternatives 2 and 3.

Alternative 4 is designed to have the most environmental and ecological protections of all alternatives and would have the most protective access restrictions within the marine zone specific regulations. Overall, Alternative 4 would include an additional 44 percent of zoned area than that within the current sanctuary boundary (Table 5.4). Alternative 4 strives to meet a balance between protection of targeted site specific locations where resource damage is evident while also providing protection of the largest area of contiguous habitats compared to the other proposed alternatives (Table 5.4). To do this, larger marine zones would be included in each of the five geographic regions (Upper Keys, Middle Keys, Lower Keys, Marquesas, and Tortugas). This approach aims to more fully meet Goal 2 of the advisory council regulatory and zoning alternatives development workplan: "Protect large, contiguous, diverse, and interconnected habitats that provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life and protect and preserve all habitats and species." In addition, Alternative 4 includes protections for a new habitat type – mesophotic coral reefs – through a proposed sanctuary boundary expansion that would include Pulley Ridge. This proposed boundary expansion is aligned with an existing and proposed update to a Gulf of Mexico Fishery Management

Council (GMFMC) habitat area of particular concern (HAPC), and would provide additional protections to unique mesophotic coral reefs and other endemic species found only in this region.

5.7.1 Analysis of the environmentally preferred alternative

There are environmental tradeoffs among the alternatives and within resource issue areas or topics, making it difficult to summarize the net effect of the alternatives. Overall, all of the action alternatives would result in beneficial impacts in one or more environmental issue areas, and none of the action alternatives would result in a significant adverse impact.

The analyses below in tables 5.3 and 5.4 demonstrate the scale of the increasing protection of sanctuary area and area protected within marine zones from Alternative 2 to Alternative 4. Alternatives 2, 3, and 4 include expansion in overall area of the sanctuary and the addition of the area to be avoided (ABTA) and Tortugas. Alternative 4 also includes the addition of the Pulley Ridge expansion area. The size of marine zone protection across alternatives (Table 5.4) further indicates increased ecological protection of habitats among action alternatives, where Alternative 2 protects 1,129 square miles in marine zones, Alternative 3 protects 1,141 square miles in marine zones, and Alternative 4 protects 1,433 square miles in marine zones. In the economic comparison across alternatives (Table 5.5), each category experiences a stepwise increase net economic benefit with increasing environmental protection. For example, ONMS estimated the net benefit for person-days of visitation and recreation in the sanctuary would be 133,014 for Alternative 2, 159,568 for Alternative 3, and 923,823 for Alternative 4. The benefits for Alternative 4 estimated here represent the maximum potential benefits from non-consumptive recreation (i.e., scuba, snorkeling, and wildlife viewing) that could accrue in the long run as a result of protecting Pulley Ridge. For more details on the short-term benefits see Leeworthy et al. 2019.

To more quantitatively compare environmental impacts to sanctuary resources across alternatives, ONMS used the advisory council goals and objectives developed for the management plan review process (available at www.floridakeys.noaa.gov/blueprint), and the spatial modeling tool Marxan (Bell and Possingham). Marxan is a decision support tool that managers use to evaluate management options. It works by applying the desired ecological goals to the selected spatial area (in this case, the sanctuary), and through a series of analyses, creates a “heat map” showing areas of ecological importance based on the desired goals.

Subsequently, ONMS used the Spatial Analysis and Resource Characterization Tool (SPARC) to quantify the percentages of select biological and ecological features that are included in each of the proposed marine zone alternatives (shown below in Figure 5.1). SPARC can be used both as a gap analysis to identify how well the alternatives achieve the advisory council goals and objectives, and to show the differences between alternatives. This analysis revealed increased protection of all resource categories between the no action alternative and the three action alternatives (alternatives, 2, 3, and 4), in addition to slight increases in protection of most resources from Alternative 2 to Alternative 4. The contrast between the no action and action alternatives is most dramatic for fish spawning aggregations, where alternatives 2, 3, and 4 each protect over 10 percent more of this resource than the no action alternative. Additionally, Alternative 4 protects substantially more mangrove, seagrass, and consolidated hardbottom habitats than the other action alternatives. Each action alternative provides additional protections beyond what would occur under the no action alternative.

The analysis of the environmental consequences of each of the alternatives shows that no single alternative is the environmentally preferred alternative. Rather, all of the action alternatives are environmentally preferable because they would result in beneficial impacts (e.g., protect biological, physical, cultural, and socioeconomic resources), and none of the action alternatives would result in significant adverse impacts. Although Alternative 4 is the most environmentally protective and would protect the greatest total area, it would also experience negligible adverse impacts over a larger area than alternatives 2 and 3. Alternative 2, on the other hand, would protect fewer marine zones than alternatives 3 or 4, but would also experience negligible adverse impacts over a smaller area than alternatives 3 or 4. Therefore, there is not a single most environmentally preferable alternative.

Comparison of proposed sanctuary boundary alternatives

Table 5.3. Boundary expansions in FKNMS by alternative (square miles)

Alternatives	Total area	Expansion area	ATBA expansion	Tortugas expansion	Pulley Ridge ¹
1 - no action	3,800	0	0	0	0
2	4,541	743	472	271	0
3 - preferred	4,541	743	472	271	0
4	4,800	1,002	472	271	259

1. Pulley Ridge comprises two habitat areas of particular concern (HAPCs). Pulley Ridge South is 214 square miles and Pulley Ridge South Portion A is 199 square miles. Both areas protect corals. Portion A was proposed by Final Amendment 9 to the Fishery Management Plan for Coral and Coral Reefs of the Gulf of Mexico, U.S. Waters (Gulf of Mexico Fishery Management Councils 2018).

Comparison of proposed marine zone alternatives

Table 5.4. Number and size of marine zones by type of zone and regulatory alternative

Alternatives	Sanctuary boundary (sq. miles)	Total zoned (sq. miles) ¹	Additional zoned area (percent)	Number of WMAs ²	Number of SPAs ³	Number of ER/SUA /CA ^{4,5,6}	Number of EMA/MA ⁷	Total marine zones
1 - no action	3,800	1,033	0.00	28	19	6	4	57
2	4,541	1,129	9.29	59	25	8	4	96
3 - preferred	4,541	1,141	10.45	60	26	8	4	98
4	4,800	1,433	44.24	59	22	13	4	98

1. Includes area included in national wildlife refuges
2. Wildlife management areas
3. Sanctuary preservation areas, no-take areas
4. Ecological reserves, no-take areas
5. Special use areas, set aside for restoration or research only
6. ERs and SUAs changed to conservation areas in alternatives 2, 3, and 4
7. Existing management areas and management areas, includes national wildlife refuges

Table 5.5. Comparison of socioeconomic benefits across the action alternatives. The no action alternative was not included because there would be no changes to economic indices under the no action alternative.

Increase in number of person-days	211,822	238,376	1,009,164
Increased spending in direct expenditures (e.g., tour companies)	\$30,379,894	\$34,109,399	\$144,401,762
Increased spending within Monroe County (sales/output)	\$34,025,481	\$38,202,527	\$161,729,974
Increased income within Monroe County (jobs)	\$14,914,158	\$16,744,129	\$70,886,096
Increased number of jobs	420.6	472.2	1,999.1
Adverse impacts²			
Lost fishing revenue	\$585,216	\$585,216	\$813,989
Lost number of person-days	78,808	78,808	85,341
Decreased spending in direct expenditures (e.g., tour companies)	\$13,032,120	\$13,032,120	\$14,080,871
Decreased spending within Monroe County (sales/output)	\$15,643,739	\$15,643,739	\$17,234,784
Decreased income within Monroe County (jobs)	\$7,426,263	\$7,426,263	\$8,226,394
Decreased number of jobs	55.7	55.7	223.6
Net benefits			
Number of person-days	133,014	159,568	923,823
Spending in direct expenditures (e.g., tour companies)	\$17,347,773	\$21,077,278	\$130,320,891
Spending within Monroe County (sales/output)	\$18,381,743	\$22,558,788	\$144,495,190
Income within Monroe County (jobs)	\$7,487,895	\$9,317,866	\$62,659,702
Number of jobs	364.9	416.5	1,775.5

1. All of the beneficial impacts are due to increases in non-consumptive recreation.
2. All of the adverse impacts are due to losses to recreational and commercial fishermen.
3. The benefits for Alternative 4 estimated here represent the maximum potential benefits from non-consumptive recreation (i.e., scuba, snorkeling and wildlife viewing) that could accrue in the long run as a result of protecting Pulley Ridge. For more details on the short-term benefits see Leeworthy et al. 2019.

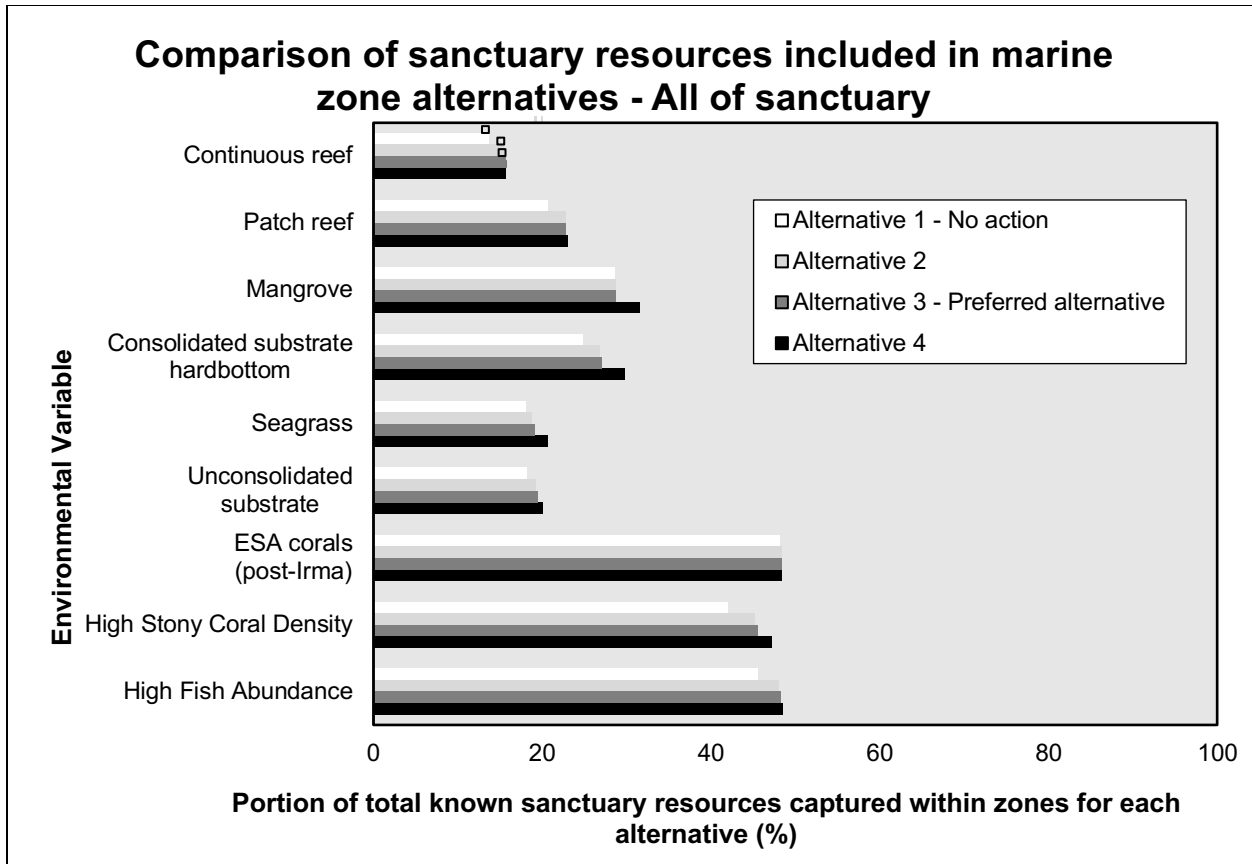


Figure 5.1. Comparison of sanctuary resources protected in marine zone alternatives

5.8 Cumulative impacts

CEQ’s NEPA regulations at 40 CFR § 1508.7 define cumulative impacts as “the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (CEQ 1997). Cumulative impacts can result from individually minor but collectively significant actions that take place over time. CEQ’s guidance for considering cumulative effects states that NEPA documents “should compare the cumulative effects of multiple actions with appropriate national, regional, state, or community goals to determine whether the total effect is significant” (CEQ 1997).

Under the no action alternative (Alternative 1), NOAA would continue to implement sanctuary protections and management activities in the existing sanctuary and marine zone boundaries. Under alternatives 2, 3, and 4, NOAA would expand the sanctuary boundary, modify and propose new marine zones, update sanctuary-wide and marine zone specific regulation, and update management plan activities.

The actions considered below are similar to the proposed action, large enough to have far-reaching effects, or are in proximity to the proposed action with similar types of impacts.

This section presents the methods used to evaluate cumulative impacts, lists projects that may have cumulative effects when combined with the impacts from the proposed action or alternatives discussed in this DEIS, and evaluates potential cumulative impacts.

5.8.1 Cumulative impact assessment methods

CEQ’s cumulative effects guidance sets out several different methods for assessment such as checklists, modeling, forecasting, and economic impact assessment, where changes in employment, income, and population are evaluated (CEQ 1997). This DEIS uses a variety of methods, depending on the resource area, to determine cumulative effects. In general, past, present, and future foreseeable projects are assessed by topic area. Cumulative effects may arise from single or multiple actions and may result in additive or interactive effects. Interactive effects may be countervailing, where the adverse cumulative effect is less than the sum of the individual effects, or synergistic, where the net adverse effect is greater than the sum of the individual effects (CEQ 1997). The projects in Table 5.6 are anticipated to occur in the reasonably foreseeable future within the study area. NOAA has considered the effects of these actions in combination with the impacts of the proposed action to determine the overall cumulative impact on the resources in the study area.

Table 5.6. Actions with potential to contribute to cumulative impacts

Action	Action location	Action agency	Action description	Projected completion
NPS management plan implementation	Biscayne, Everglades, and Dry Tortugas	DOI	Biscayne National Park and Everglades National Park have finalized and are implementing updated management plans	Ongoing
National wildlife refuge management	Key Largo and Middle to Lower Keys	DOI	Implementation of comprehensive conservation plans and review and update of backcountry management plan	Ongoing
Other regional land management efforts	South Florida	Miami Dade and Monroe counties	State and local land management	Ongoing
EFH and HAPC designations and management	Pulley Ridge	NMFS/GMFMC	GMFMC is mandated to identify, describe, map, and protect EFH. The HAPC at Pulley Ridge has recently been modified.	Designation complete, management ongoing
Central Everglades Planning Project (CEPP)	South Florida	USACE	USACE is required to identify a suite of restoration projects for congressional authorization as part of the Comprehensive	Ongoing

			Everglades Restoration Plan (CERP).	
Florida Department of Environmental Protection (DEP) National Pollutant Discharge Elimination System (NPDES) permit review	South Florida, Card Sound	Florida DEP	NPDES permit reviews and renewals	Ongoing
Monroe County canal demonstration projects	Monroe County, nearshore canals	EPA, Federal Emergency Management Agency (FEMA)	Execution of canal demonstration projects as part of the WQPP priorities and general canal clean-up following Hurricane Irma	Ongoing
Urbanization	South Florida	State, county, local, and private entities	Continued growth and development	Ongoing

5.8.2 Past, present, and reasonably foreseeable future projects

The numerous actions that could contribute to cumulative impacts are listed in Table 5.6. This list was compiled from several sources. Only those actions with potential to contribute to cumulative impacts are listed. These actions are similar in scope to the proposed action, relate to marine activities, have similar types of impacts within the study area, affect similar resources, or are large enough to have far-reaching effects on a resource. This approach was taken to include actions for which detailed descriptions and expected impacts are known, as well as actions that have less defined impacts but may contribute to the regional impacts.

As the proposed action for FKNMS is a regulatory and management action rather than a specific development action, the cumulative effects are related primarily to local and regional management of ocean resources. Several of the actions listed in Table 5.6 are regulatory as well. For the purposes of this cumulative analysis, it is assumed that the actions in Table 5.6 that have not already been implemented would be approved and implemented.

The combination of the alternatives and actions in Table 5.6 would result in cumulative beneficial impacts to biological, physical, and historical resources. The cumulative actions identified in Table 5.6 would not cause adverse impacts on those resource categories. In other issues, as described below, the proposed alternatives’ contribution to any adverse cumulative impacts would be minor.

5.8.2.1 Biological and physical resources

The proposed action would not contribute to any significant adverse impacts on habitats, wildlife, protected species, climate, water, or historical resources, as identified above. The preferred alternative, combined with ongoing NPS management plan implementation, EFH and HAPC designations, NPDES permit reviews, CEPP project implementation, and Monroe County canal demonstration projects, would have an overall beneficial cumulative effect on biological and physical resources in the region. The

combined resource protection provided by these programs and associated regulations would result in positive influences on marine habitats and resources.

Cumulative impacts analysis related to threats identified in the condition report and current sanctuary resource condition

Current threats to biological sanctuary resources include continued discharges including soil, nutrients, and other pollutants washing into wetlands and coastal waters from urban and agricultural stormwater runoff; continued conversion and fragmentation of wildlife habitat from development, habitat loss, overexploitation of large fish and keystone species; and introduction of invasive species. The condition of the sanctuary is also influenced by factors which occur outside its boundaries, such as regional impacts to water quality and global climate change. Human actions, such as poaching, vessel groundings, and discharging of marine debris, continue to negatively affect the habitat and living resources of the sanctuary. These activities will likely decrease the overall availability and quality of marine and wetland habitats. Species with threatened, endangered, or declining populations are likely to be more sensitive to declines in habitat availability and quality and the introduction of invasive species. However, the proposed action is designed to address, and where possible, ameliorate these threats. Overall, the cumulative effects of the proposed action in combination with other past, present, and reasonably foreseeable future actions would be an overall net benefit.

Cumulative impacts analysis related to other federal, state, and local parks

Federal, state, and local parks and wildlife refuges located near FKNMS provide valuable habitat to native wildlife, migratory birds, fish, and other mobile biota. As agricultural activities, development, and urbanization increase habitat conversion and fragmentation, these protected areas will become ecologically more important as the amount of minimally-disturbed habitat decreases. Habitat loss, in general, can negatively affect breeding success, dispersal success, predation rates, and other animal behaviors. In addition, the cumulative area protected by FKNMS and other federally-, state-, or locally-managed areas and associated regulations provide biota with a larger area of contiguous, or minimally fragmented, habitat. Habitat fragmentation (the breaking up of a larger area of habitat into smaller patches) disrupts many basic ecological interactions of a community, including predator-prey, parasite-host, and plant-pollinator, and can result in cascading extinctions. Therefore, the cumulative effects of proposed action in combination with the continued management of other federal, state, and local parks and refuges would be a net benefit to aquatic and terrestrial biota.

Cumulative impacts analysis related to regional hydrography and water quality

Regional conditions outside FKNMS strongly influence sanctuary waters in this highly interconnected system of coastal and estuarine waters. Under certain conditions, external sources adjacent to the sanctuary (such as Florida and Biscayne bays, the Loop and Florida currents, riverine waters and other land-based activities, and atmospheric inputs) can influence or even dominate water quality conditions. Specifically, the South Florida ecosystem has been extensively altered through development of drainage canals completed to facilitate coastal development, agriculture, and flood control. These canals have significantly altered the distribution, timing, and quality of freshwater flow within the South Florida watershed, resulting in degraded marine habitats and other environmental changes that continue to impact the estuaries of Florida Bay and the Florida Keys. Therefore, the cumulative effects of the proposed

action in combination with the continued implementation of CEPP projects would be a net benefit to aquatic and terrestrial biota.

5.8.2.2 Cultural and historical resources

The proposed action would contribute toward preservation of important resources throughout FKNMS, and no significant adverse effects on cultural and historical resources are anticipated from the proposed action. Cumulative effects that could impact cultural and historical resources may include impacts from increased visitation to historic shipwrecks resulting from interpretation of the resources. However, the sanctuary would continue to extend education and outreach to minimize any unforeseen adverse impacts to historic shipwrecks as a result of the potential increased visitation.

Population growth and increased tourism may lead to minor adverse impacts. These unintended cumulative impacts would be minimized by education and research activities both at the sanctuary and through collaborative efforts. One effort to foster partnerships among agencies to protect historical resources is the draft programmatic agreement among NOAA, the state of Florida's State Historic Preservation Officer, and the Advisory Council on Historic Preservation for compliance under Section 106 of the NHPA to further joint management of FKNMS historical resources. NOAA is seeking public comment on this draft programmatic agreement, available in Appendix C.

5.8.2.3 Socioeconomic resources and human uses

As identified above, the proposed action would result in beneficial impacts on tourism, recreation, local economies, research, education, and passive economic use. Cumulative impacts from other reasonably foreseeable action could result from population growth, and increased tourism may lead to minor adverse impacts beyond what the sanctuary can effectively manage. These actions could increase the number of recreational users and fishermen within the sanctuary, potentially resulting in more densely-used areas within FKNMS. Nonetheless, FKNMS regularly reviews its management plan and regulations and could update these documents, if necessary, should increased urbanization or tourism lead to competition for access to the sanctuary. Thus, the actions listed in Table 5.6 would not be expected to result in significant cumulative impacts on socioeconomic resources or human uses in FKNMS.

CHAPTER 6 CONCLUSIONS

6.1 Summary of preferred alternative

NOAA's preferred alternative is Alternative 3, which includes the following components: (1) changes to the sanctuary boundary, (2) updating sanctuary-wide regulations, (3) modifying existing marine zones and creating new ones, (4) updating marine zone-specific regulations, and (5) updating the sanctuary management plan. A summary of each of these components is included below.

6.1.1 Sanctuary expansion to encompass the area to be avoided and the Tortugas Region

For the sanctuary boundary, the preferred alternative (Alternative 3) includes: (1) the Tortugas region and (2) expansion to encompass the area to be avoided. The preferred alternative would not include a distinct unit at Pulley Ridge. The expanded sanctuary boundary for the preferred alternative would encompass a total area of 4,541 square miles, which is 741 square miles greater than the existing sanctuary boundary area.

The expansion in the Tortugas region aligns with the existing particularly sensitive sea area (PSSA), encompasses the Tortugas South ER, and extends to the west of the Tortugas South ER by one mile. This expansion provides additional protections for important ecological resources and the ecological connectivity in the region, particularly between Tortugas North and South ERs and Tortugas Bank. The ATBA boundary expansion proposes aligning the geographic boundary of the sanctuary with the existing ATBA boundaries. This proposed boundary expansion would clarify NOAA's area of responsibility and enhance compliance and enforcement. For a summary across alternatives see Figure 3.1 and Table 3.1. For more details, see also Section 3.6.

6.1.2 Sanctuary-wide regulations

For sanctuary-wide regulation updates, the preferred alternative (Alternative 3) would update three existing sanctuary-wide regulations and add four new sanctuary-wide regulations. In general these proposed updates and new regulations provide NOAA additional authority to protect sanctuary resources, more rapidly respond to impacts to sanctuary resources, and in some cases create consistency with other sanctuary and state regulations. The preferred alternative also includes a non-regulatory management update (discussed in Section 3.2.1) to provide additional coordination of live rock aquaculture activities.

6.1.3 Marine zone boundaries and associated regulations

For marine zone boundaries and associated regulations, the preferred alternative (Alternative 3) would maintain many of the marine zones in the no action alternative (Alternative 1) and would add new marine zones to provide additional site-specific protection where resource damage is evident. Alternative 3 would place greater emphasis on resource protection as compared to the level of use. The preferred alternative aims to balance conservation protection measures and access to sensitive areas by applying access recommendations that would be more restrictive than the no action alternative and Alternative 2, and less restrictive than Alternative 4. Alternative 3 would also establish limited use areas to further promote sustainable use and test the application and impact of limited use areas in the sanctuary.

Specifically, Alternative 3 would add 32 wildlife management areas, seven sanctuary preservation areas, and two conservation areas compared to the no action alternative.

6.1.4 Management plan

The management plan component of the preferred alternative (Alternative 3) includes an updated management plan with a vision, mission, goals, objectives, and activities designed to facilitate understanding of sanctuary resource condition and value. This understanding will be applied to target management action, reduce impacts to resources, and enhance stewardship and collaboration. An updated management plan would allow for a more coordinated and priority-driven effort. As a result, it would support more effective management and conservation-based outcomes.

6.2 Unavoidable adverse impacts

An environmental impact statement must describe any significant unavoidable impacts for which either no mitigation or only partial mitigation is feasible. The environmental impacts of the proposed action and alternatives are described in Chapter 5. No unavoidable significant adverse impacts were identified for any of the action alternatives (alternatives 2, 3, and 4). The no action alternative (Alternative 1) could result in significant adverse impacts to cultural and historical resources outside the existing sanctuary but within U.S. federal waters of the proposed expansion area that would not be adequately protected from activities that could harm or destroy such nonrenewable resources.

6.3 Relationship of short-term uses and long-term productivity

NEPA requires consideration of the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity (42 U.S.C. § 4332(C)(iv); 40 C.F.R. § 1502.16). The short-term uses of the environment as a sanctuary that balances between resource protection and sustainable use limits some recreational and commercial activities. For example, the sanctuary-wide and marine zoning regulations would improve the health and quality of the marine environment by protecting living marine resources and habitats by (1) modifying and adding new marine zones with associated regulations designed to protect sensitive habitats and wildlife; (2) providing a mechanism to respond to groundings and release of harmful matter; and (3) monitoring human activities through regulations and non-regulatory programs that incorporate community involvement in the stewardship of sanctuary resources. In addition, the marine zones would allow for recreational and commercial use within certain parts of the sanctuary.

Long-term productivity derived from the proposed action is based on the goals of the Sanctuary Advisory Council for this management plan review process and the suite of proposed management activities designed to achieve these goals as identified in Section 3.5, which includes a revised FKNMS draft management plan. These include goals related to improving understanding of the ecosystem services and economic value of sanctuary resources, maintaining or improving the condition of sanctuary resources, reducing threats and managing human uses and associated impacts, increasing awareness and support for the sanctuary, and advancing collaborative and coordinated management.

6.4 Irreversible and irretrievable commitments of resources

NEPA requires an analysis of the extent to which the proposed project's primary and secondary effects would commit nonrenewable resources to uses that future generations would be unable to reverse (42

U.S.C. § 4332(C)(v); 40 C.F.R. § 1502.16). The mission of the national marine sanctuary is to conserve resources for future users, but routine management activities and protective regulations may require some irreversible and irretrievable commitments of resources.

Irreversible commitments of natural resources include the consumption or destruction of non-renewable resources or degradation of renewable resources over long periods of time. The proposed action would result in the following irreversible commitments of natural resources:

- Nonrenewable resources that would be consumed during management and research activities include fuel, water, power, and other resources necessary to maintain and operate the sanctuary's research vessels and the sanctuary offices.
- Electricity to power sanctuary facilities would be an irreversible use of resources, if derived from a non-renewable electrical power source (e.g., natural gas or nuclear energy).

Irretrievable commitment of resources includes opportunities foregone, expenditure of funds, loss of production, and restrictions on resource use. The proposed action would result in the following irretrievable commitments of natural resources:

- Monetary funds would be expended to support management activities in the purchase of fuels, electricity, water, and other non-renewable supplies, for wages and rents, and for construction of facilities.
- As part of the balance to protect natural resources versus limit human uses within the sanctuary, marine zones that restrict access would prevent recreational and commercial uses in parts of the sanctuary. Human uses would be less restricted within other portions of the sanctuary.
- Natural resources may be used in construction of sanctuary facilities and structures, such as buildings, signs, navigational markers, and mooring buoys.
- Benthic habitat would be physically altered in the installation of mooring buoy anchors, navigational markers, and other permanently fixed informational and regulatory signs.
- Cultural resources would be protected from long term damage, but some research use may be restricted.

The irreversible and irretrievable commitment of resources would be minimized and mitigated by best management practices, staff training, and sustainability goals and procedures documented in the sanctuary management plan.

CHAPTER 7

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APPENDIX A

DOCUMENT PREPARERS

This document was prepared by several staff members at NOAA’s Florida Keys National Marine Sanctuary with significant assistance from NOAA’s Office of National Marine Sanctuaries and NOAA’s National Centers for Coastal Ocean Science. Cooperating agency support was provided by the U.S. Fish and Wildlife Florida Keys National Wildlife Refuge Complex staff. This proposal for updates to Florida Keys National Marine Sanctuary was informed by many years of input from the Florida Keys National Marine Sanctuary Advisory Council and their working groups. This dedicated group consists of community representatives of fishing, diving, cultural resources, conservation, education, research, and governmental interests (<https://floridakeys.noaa.gov/sac/members.html?s=sac>).

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APPENDIX B

MINOR OR TECHNICAL REVISIONS AND UPDATES

Introduction

This appendix identifies minor or technical revisions and updates to regulatory definitions, terms, and provisions that FKNMS is proposing to update. The proposed updates would not result in direct, indirect, or cumulative impacts on any sanctuary resources in the existing sanctuary or proposed expansion area. Therefore, these proposed regulatory changes are not discussed in Chapter 5, Environmental consequences. The proposed changes described below would be implemented for all of the alternatives considered in this DEIS, except for the No Action alternative.

Definitions and terms

The following existing definitions and terms would be updated for greater consistency with the state of Florida Administrative Code (F.A.C.), National Marine Sanctuary System-wide regulations, other sanctuary-specific regulations, and the updated FKNMS management plan.

Definitions:

1. *Idle speed only/no wake* would be updated to be consistent with state law at 68D-23.103(3)(b), (d)-(f), F.A.C., for boating restricted areas. All other references to *idle speed only/no wake* in FKNMS regulations would be updated (e.g., officially marked channel).
2. *Idle speed only/no-wake zone* would be updated to be consistent with state law at 68D-23.103(3)(b), (d)-(f), F.A.C., for boating restricted areas. All other references to this zone type in FKNMS regulations would be updated.
3. *Marine life species* would be updated to correct the state code citation.
4. *No-access buffer zone* would be replaced with the term “*No vessel zone*,” and the definition would be updated to be consistent with state law at 68D-23.103(3)(b), (d)-(f), F.A.C., for boating restricted areas. All other references to this zone type in the FKNMS regulations would be updated to reflect the new term.
5. *Tropical fish* would be updated to correct the state code citation.

Terms:

1. All references to the term *seabed* would be replaced by the term *submerged lands*.
2. Terms used to describe the types of activities and projects that are exempt from the *alteration of, or construction on, the seabed* regulation would be updated. The updated terms would expressly exempt a number of small-scale construction projects that are minor in scope and would not result in adverse impacts to sanctuary resources. In addition, the term “breakwater” would be removed from the list of currently exempt activities, as breakwaters are not commonly built in the Florida Keys and tend to require more extensive review and coordination with other local, state, and federal agencies.
3. The term littering would be added to the discharge or deposit of material or other matter regulation.

Regulations

The following regulations would be updated for greater consistency with the state of Florida F.A.C., National Marine Sanctuary System-wide regulations, other sanctuary-specific regulations, and the updated FKNMS management plan.

1. *Boundary coordinates* would be added to more clearly delineate the existing sanctuary boundary for the areas adjacent to Everglades National Park and Card Sound.
2. *Vessel operations around divers down flags* would be changed to incorporate the updated definition for idle speed no wake areas as noted above and would be updated to be consistent with Chapter 327.331, Florida Statutes.
3. *Conduct of diving/snorkeling without a flag* would be updated to be consistent with Chapter 327.331, Florida Statutes, which addresses both vessel behavior around divers and diver behavior.
4. *Take or possession of protected wildlife* would be updated to more accurately capture the listed wildlife species present in sanctuary waters (e.g., in addition to marine mammals and turtles, this updated terminology would include corals and crocodiles), and a definition for *protected wildlife* would be added. The species that would be added are already protected by existing state or federal laws, such as stony corals listed under the Endangered Species Act.
5. *Exemptions for law enforcement* would be updated and consolidated to more accurately reflect the types of prohibited activities that officers may need to undertake during routine operations.
6. Prohibitions on permits for mineral or hydrocarbon development, disposal of dredged spoil, or discharge of sewage would be updated to correct regulatory citations and provide clearer language.
7. *Great White Heron and Key West National Wildlife Refuge Management Areas* would be updated with geographic coordinates versus township information to explain where personal watercraft, waterskiing, or airboat use is allowed. The term *Management Areas* will be removed and *National Wildlife Refuge* will be defined.
8. *Restoration permit* would be added as a category of general permit that may be issued by the director to further restoration of natural resources and advance sanctuary management goals. These types of activities are currently addressed through the general permit category, “Further the natural or historical resource value of the sanctuary.” Adding a restoration permit category would more accurately describe the activities currently being permitted and help facilitate tracking of such projects.
9. *Certification of pre-existing leases, permits, approvals, other authorizations, or rights to conduct a prohibited activity* would be added to address any pre-existing activity conducted in a sanctuary expansion area pursuant to a valid federal, state, or local lease, permit, license, approval, or other authorization in existence prior to the effective date of sanctuary expansion. A similar provision was included in the original FKNMS regulations for activities that pre-dated sanctuary designation, but was later removed because it was no longer applicable.

APPENDIX C

DRAFT

**PROGRAMMATIC AGREEMENT
AMONG**

**NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
(U.S. DEPARTMENT OF COMMERCE)
OFFICE OF NATIONAL MARINE SANCTUARIES,**

**FLORIDA DEPARTMENT OF STATE
DIVISION OF HISTORICAL RESOURCES
STATE HISTORIC PRESERVATION OFFICER,**

AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

**REGARDING FLORIDA KEYS NATIONAL MARINE SANCTUARY OPERATIONS,
MANAGEMENT, AND PERMITTING**

WHEREAS, the National Oceanic and Atmospheric Administration’s (NOAA) Office of National Marine Sanctuaries (ONMS) is the federal agency with statutory authority to implement the National Marine Sanctuaries Act under 16 USC §§ 1431 *et seq.* for areas designated across the United States as national marine sanctuaries;

WHEREAS, Florida Keys National Marine Sanctuary (FKNMS or sanctuary) was designated under the Florida Keys National Marine Sanctuary and Protection Act (Public Law 101-605, 104 Stat. 3089 (Nov. 16, 1990)) to protect the resources of the sanctuary, to educate and interpret for the public regarding the Florida Keys marine environment, and to manage human uses of the sanctuary;

WHEREAS, the ONMS developed and subsequently revised a comprehensive Management Plan (1996, revised in 2007 and 2019 in draft) and regulations (15 CFR Part 922, Subpart P) to protect sanctuary resources and manage the sanctuary;

WHEREAS, the purpose of this Programmatic Agreement (PA) is for the ONMS, the Florida State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation (ACHP) (hereinafter referred to as the “Signatory Parties” or “Parties”) to establish a process by which the ONMS will comply with Section 106 of the National Historic Preservation Act (NHPA) (54 USC § 306108) and implementing regulations (36 CFR Part 800);

WHEREAS, the ONMS has determined that the routine operation, management, and implementation of the ONMS’s programs and policies and issuance of permits and authorizations entail undertakings that may affect historic properties (as defined at 36 CFR § 800.16(l)), including properties listed in or that may be eligible for listing in the National Register of Historic Places, which are therefore subject to review under Section 106 of the NHPA (54 USC § 306108) and implementing regulations (36 CFR Part 800);

WHEREAS, the ONMS, in consultation with the SHPO and the ACHP, has determined that the ONMS's Section 106 requirements for FKNMS can be more effectively and efficiently implemented if a programmatic approach is used in accordance with 36 CFR § 800.14(b)(2);

WHEREAS, if there are any other agreements within NOAA among the ACHP / SHPO regarding the ONMS's section 106 compliance that conflict with these procedures, this PA shall take precedence;

WHEREAS, the ONMS has determined this PA will apply to the entire FKNMS (as defined in 15 CFR § 922.161), encompassing both submerged state lands and submerged federal lands. The shoreward boundary of FKNMS is the mean high water mark, except where the boundary is coterminous with that of the Dry Tortugas or Biscayne National Parks. This undertaking's area of potential effects (APE) is illustrated in Appendix A to this Agreement;

WHEREAS, the ONMS is responsible for ensuring that activities identified in the FKNMS Management Plan are carried out to the fullest extent possible to ensure the primary protection of sanctuary resources, including routine operation, management, and implementation of sanctuary programs and policies throughout all waters of the sanctuary (as defined by 15 CFR § 922.161);

WHEREAS, the FKNMS Superintendent, as delegated by the Director of the ONMS is authorized under 15 CFR §§ 922.166 and 167 to issue permits to allow activities that would otherwise be prohibited by FKNMS regulations, and is further able to authorize otherwise prohibited activities under 15 CFR § 922.49;

WHEREAS, the ONMS has consulted with the SHPO regarding ways to ensure that FKNMS operations, management, and permit issuance provides for the management of the sanctuary's historic properties in accordance with the intent of ONMS policies, FKNMS Management Plan, and the NHPA;

WHEREAS, the ONMS has consulted with the Seminole Nation of Oklahoma regarding undertakings reviewed under this PA that may affect historic properties of religious and cultural significance and on ways to ensure that FKNMS operations, management, and permit issuance provides for the management of the sanctuary's historic properties in accordance with the intent of tribal interests and policies. Additionally, the ONMS has provided an opportunity for the Seminole Tribe of Florida and Miccosukee Tribe of Florida to consult on this PA;

WHEREAS, in accordance with 36 CFR § 800.14(b), ONMS has invited the ACHP to participate in the consultation, and the ACHP has elected to participate;

WHEREAS, the ONMS will consult with sanctuary stakeholders through engagement with the following parties through the FKNMS Regulatory Review and Draft Environmental Impact Statement (DEIS) process: FKNMS Advisory Council, FKNMS Historical Resource Survey/Inventory and Research/Recovery Permittees, Florida Public Archaeology Network, Historic Preservation Society of the Upper Keys, Key West Art and Historical Society, and the Monroe County Historic Preservation Commission regarding the effects of the undertaking on historic properties and has invited them to provide comment on the proposed PA;

WHEREAS, the ONMS has arranged for public participation appropriate to the subject and scope of this PA by notifying the individuals, organizations, and entities likely to be interested in the PA and seeking

their input during the development of this PA. Opportunities for public comment will be available as the draft PA will be released and noticed as part of the FKNMS Regulatory Review and DEIS;

WHEREAS, it is appropriate for the ONMS and the SHPO to enter into this PA because certain FKNMS-related undertakings cause similar, repetitive, or regional effects on historic properties or involve routine management activities (36 CFR § 800.14(b)(1));

NOW, THEREFORE, the ONMS, the SHPO, and the ACHP agree that undertakings at FKNMS shall be implemented in accordance with the following stipulations in order to take into account their effects on historic properties.

STIPULATIONS

The ONMS shall ensure that the following measures are carried out:

I. APPLICABILITY AND AREA OF POTENTIAL EFFECTS

This PA applies to all operation, management, and implementation of FKNMS programs and policies and issuance of permits and authorizations for activities within waters of the sanctuary, as carried out by the FKNMS Superintendent or his/her designee.

- A. For the purposes of this PA, the Area of Potential Effects (APE) includes all waters of the sanctuary (as defined in 15 CFR § 922.161), including state waters (approximately 60% of the sanctuary) and federal waters (approximately 40% of the sanctuary). Maps of the APE are included in Appendix A. A list of known and potential historical resources³ contained in the APE are included in Appendix G.
- B. While the ONMS may not legally be required to consult under section 106 for operation and management activities occurring in federal waters of FKNMS, the ONMS will nonetheless operate in accordance with the terms of this PA for all such undertakings within the APE. This approach is consistent with past Programmatic Agreements between NOAA/ONMS, ACHP, and SHPO, and furthers the joint management and protection of FKNMS historical resources.
- C. The ONMS will integrate the manner in which it meets its historic preservation responsibilities as fully as possible with its other responsibilities for sanctuary conservation, protection, and management under the NMSA, FKNMSPA, NEPA, and other statutory authorities, executive orders, and policies.

II. RESPONSIBILITIES, QUALIFICATIONS AND TRAINING

- A. The ONMS Director is the agency official responsible for ensuring that the management of national marine sanctuaries is consistent with the NHPA.

³ Sanctuary historical resource (as defined by 15 CFR § 922.3) means any resource possessing historical, cultural, archaeological or paleontological significance, including sites, contextual information, structures, districts, and objects significantly associated with or representative of earlier people, cultures, maritime heritage, and human activities and events. Historical resources include “submerged cultural resources”, and also include “historic properties” as defined in the National Historic Preservation Act.

- B. The FKNMS Superintendent is the agency official with jurisdiction over undertakings in FKNMS for purposes of section 106 compliance.
- C. The FKNMS Superintendent may delegate reviews of activities and reporting under this PA to relevant ONMS personnel; however, the FKNMS Superintendent is responsible for any determinations of eligibility and effects.
- D. FKNMS staff advising the FKNMS Superintendent on effects to historic properties from undertakings, determining potential for National Register of Historic Places eligibility, directing archaeological research and providing the FKNMS Superintendent with recommendations on the issuance of archaeological research permits will meet the Secretary of the Interior's (SOI) Historic Preservation Professional Qualification Standards. FKNMS staff conducting activities pursuant to this PA will be required to undertake NHPA training provided by the Advisory Council on Historic Preservation.
- E. The ONMS Maritime Heritage Program Director or another ONMS staff member who meets the SOI Historic Preservation Professional Qualification Standards may assist in implementation of this PA and provide guidance to the FKNMS Superintendent, as needed.
- F. For the purposes of this PA, "FKNMS staff" will refer only to FKNMS staff who meet the SOI Historic Preservation Professional Qualification Standards.
- G. The FKNMS Staff Point of Contact is: Matthew Lawrence, Archaeologist, Matthew.Lawrence@noaa.gov.
- H. The SHPO Point of Contact is: Jason Aldridge, Deputy SHPO, Jason.Aldridge@dos.myflorida.com.

III. PROCESS FOR COMPLYING WITH NHPA SECTION 106

The FKNMS Superintendent will follow the process below to meet NHPA Section 106 requirements for agency undertakings. A flow chart summarizing this process is contained in Appendix B.

- A. **Undertaking is a type of activity that does not have the potential to cause effects on historic properties:** If the undertaking is not a type of activity that has the potential to cause effects to historic properties, assuming such properties are present, the FKNMS Superintendent has no further obligations (36 CFR § 800.3(a)(1)). A list of ONMS undertakings that do not have the potential to cause effects to historic properties is available in Appendix C.
- B. **Undertaking is a type of activity that may cause effects to historic properties:** If the undertaking is a type of activity that has the potential to cause effects to historic properties, the FKNMS Superintendent (delegated to FKNMS staff) will:
 - 1. Determine and document the APE for the specific activity (36 CFR § 800.4(a)(1)).
 - 2. Identify historic properties. FKNMS staff will conduct background research on historic properties within the APE using all available information including the Florida Master Site File, and the inventory of FKNMS historical resources and, as necessary, seek

information from consulting parties and other individuals likely to have knowledge of the area (36 CFR § 800.4(a), (b)).

Depending upon the scope of the undertaking and its APE, the FKNMS staff will conduct field surveys to identify potential historic properties within the APE. In the case of an undertaking related to a permit application, the FKNMS Superintendent will require the permit applicant to conduct field surveys to identify potential historic properties within the APE.

3. Evaluate eligibility for the National Register. FKNMS staff will review the information generated from background research and field surveys by applying National Register of Historic Places criteria to determine if properties located in the APE are eligible for listing on the National Register. FKNMS staff will document their determination of National Register eligibility.

If properties are identified in the APE that may have tribal, religious or cultural significance, FKNMS staff will evaluate the historical significance of the potential historic properties in consultation with the SHPO, tribal representatives of the Seminole Nation of Oklahoma, and other Native American tribes that may attach religious or cultural significance to such properties (36 CFR § 800.4(c)).

4. Make a determination as to the effects of an undertaking on historic properties
 - a. **No historic properties are affected:** If the FKNMS Superintendent determines that either there are no historic properties present in the APE, or there are historic properties present but the undertaking will have no effect upon them (36 CFR § 800.4(d)(1)), then no further consultation by the ONMS is required.
 - b. **Undertaking may affect historic properties:** If the FKNMS Superintendent determines historic properties may be affected (36 CFR § 800.4(d)(2)), the superintendent shall modify the undertaking or impose conditions, which may include avoidance and minimization measures, so that the undertaking will not affect the historic properties' National Register characteristics to the greatest extent practicable. Common avoidance and minimization measures are outlined in Appendix D of this PA. If avoidance and minimization measures result in no adverse effects to historic properties (36 CFR § 800.5(b)), the undertaking meets the criteria for streamlined review under this section and no further consultation action is required by the ONMS.

- C. **Undertaking may cause adverse effects to historic properties:** If the FKNMS Superintendent determines that the undertaking may cause adverse effects to historic properties in the APE, and the undertaking cannot be conditioned to avoid such adverse effects, the FKNMS Superintendent will conduct section 106 consultation with the SHPO and Native American tribes that may attach religious or cultural significance to the historic properties, pursuant to 36 CFR § 800.6(a).

IV. DOCUMENTATION, REPORTING, AND ANNUAL MEETING OF SIGNATORIES

- A. FKNMS staff will document undertakings meeting the criteria of Section III.B. of this PA. Documentation will include a description of the undertaking, map of the individual APE, efforts to determine which, if any, historic properties are in the APE, avoidance or minimization efforts if appropriate, reviewer names and the comments of any reviewers involved in the process.
- B. FKNMS staff will provide the SHPO and consulting tribes with annual reports of undertakings that meet the criteria of Section III.B. for the duration of this PA. Appendix E provides a report template.
- C. FKNMS staff shall schedule an annual meeting in a mutually agreeable location and/or format (e.g., in-person, videoconferencing, or teleconferencing) to update all Signatory Parties on implementation of this PA, review work undertaken pursuant to its terms (as summarized in the annual report), and discuss any issues encountered in carrying out the terms of this PA.

V. POST-REVIEW DISCOVERIES

If potential historic properties are discovered or unanticipated effects on historic properties found during the implementation of any of the undertakings for which review has been conducted pursuant to Section III.B. of this PA, FKNMS staff shall notify the SHPO within 48 hours or as soon as reasonably possible pursuant to 36 CFR § 800.13(a)(1). FKNMS staff will make reasonable efforts to avoid and minimize adverse effects on those historic properties by applying the measures outlined in Appendix D of this PA. If the avoidance or minimization measures cannot be applied, FKNMS staff will consult with the SHPO for verbal and/or written guidance.

If human remains or other cultural material that may fall under provisions of the Native American Graves Protection and Repatriation Act (NAGPRA; 25 USC §§ 3001 *et seq.*) are present, FKNMS staff shall comply with all provisions of NAGPRA and other applicable laws. Additionally, in the event that human remains or related NAGPRA items are encountered, all work shall stop immediately and the proper authorities will be notified, including tribal representatives of the Seminole Nation of Oklahoma. Treatment of human remains will also be consistent with procedures outline in Section 872.05, Florida Statutes.

VI. EMERGENCY ACTIONS

Pursuant to 36 CFR § 800.12(b)(1), the following procedures will be followed for taking historic properties into account during FKNMS operations which respond to a disaster or emergency:

- A. Emergencies are those actions deemed necessary by the ONMS as an essential and immediate response to a disaster or emergency declared by the President, a tribal government, the Governor of the State of Florida, or to another immediate threat to life, property, or resources of the sanctuary as determined by the ONMS. Emergency actions are only those required to resolve the emergency at that time and are limited to undertakings that will be started within thirty (30) days after the emergency has been identified and/or declared, pursuant to 36 CFR § 800.12(d). Such emergency actions will be consistent with the National Oil and Hazardous

- Substances Pollution Contingency Plan (40 CFR Part 300), Emergency Support Function #11 for the Protection of Natural and Cultural Resources and Historic Properties (ESF#11 NCH) of the National Response Framework, US Coast Guard Area Contingency and Geographic Response Plans, and any other approved emergency response plans. FKNMS staff will notify the SHPO within 72 hours of the declared emergency and proposed emergency actions, or as soon as conditions allow.
- B. In addition to those emergencies declared or identified in part VI.A. above, FKNMS staff will undertake immediate protective steps including, but not limited to, movement or recovery of endangered artifacts due to damage from storms, vessel groundings, or illegal activity (e.g., looting of a site). ONMS efforts will be documented by an incident report detailing the historic properties affected, ONMS actions and rationale, site documentation, personnel involved, stabilization and/or prevention efforts, and recovered artifact conservation and curation plans.
- C. Emergency actions undertaken in part A of this section that meet the criteria for review as outlined in Section III.B. of this PA will be documented and reported to SHPO per Section IV of this PA. Emergency actions undertaken in Section VI.A. that do not meet the criteria for review under Section III.B. and all emergency actions undertaken in VI.B. will be documented and reported by FKNMS staff to the SHPO within 72 hours of completion.

VII. COLLABORATIVE HISTORIC PROPERTY MANAGEMENT

The ONMS and Florida's Division of Historical Resources (DHR) jointly seek to preserve and protect the cultural heritage resident within FKNMS. With this goal, the agencies agree to jointly pursue the inventory, documentation, and management of historic properties as trustees for the American public and for humanity at large. FKNMS and DHR staff will identify, document, evaluate and protect sanctuary historical resources per Chapter 267 of the Florida Statutes, Florida Administrative Codes 1A-32 and 1A-46, the Maritime Heritage Action Plan of the revised FKNMS Management Plan (in draft 2019) and guidance from the ONMS's Maritime Heritage Program.

Through joint efforts, staff from both agencies will build upon existing historical resource inventories by compiling several datasets, reviewing them for data quality, and then augmenting historical resource information with new data derived from historical and archaeological research. This information is supportive of efforts to identify historic properties for consideration during the alternative section 106 process described above and also supports the ONMS mandate to comply with Section 110 of the NHPA. Results from this work will be used to expand and update site records in the Florida Master Site File to enhance that dataset and improve its data quality.

Subject to the availability of resources, FKNMS and DHR staff will conduct archaeological remote sensing surveys and site investigations within both Federal and state waters of FKNMS. Archaeological research projects will be guided by a research design with research questions. Fieldwork may include minimal manual manipulation of artifacts and sediment including limited manual probing. Diagnostic artifact collection may also take place. Information generated from FKNMS archaeological research will be reported to the SHPO annually under Section IV. of this PA. Research activities conducted by FKNMS staff that may adversely affect historic properties would require consultation with the SHPO and Native American tribes as discussed in Section III.C.

FKNMS staff will continue to develop public and private partnerships for research, interpretation, and management of historical resources, including furthering collaboration under the interagency agreement with the National Park Service at Biscayne, Everglades, and Dry Tortugas National Parks. FKNMS staff will continue to interpret historical resources in the sanctuary for the public through on-site and land-based exhibits and materials. FKNMS staff will also provide any surveys, reports, or other data, including Florida Master Site File forms, generated from activities conducted under archaeological research permits to the SHPO as they are submitted to the ONMS by the permittees.

VIII. COORDINATED ARCHAEOLOGICAL RESEARCH PERMITTING

The State of Florida is authorized to protect and administer historical resources abandoned on state-owned sovereignty submerged lands pursuant to Chapter 267.031(5)(n) of the Florida Statutes and the Abandoned Shipwreck Act (43 USC §§ 2101 *et seq.*). Likewise, the ONMS has management and permitting authority over historical resources in both federal and state waters of the sanctuary through the Florida Keys National Marine Sanctuary and Protection Act, the National Marine Sanctuaries Act, and FKNMS regulations (15 CFR § 922.166).

The ONMS and the state agree to follow the procedures set forth in the PA for permitting certain archaeological research activities within FKNMS including state waters. An efficient method of issuing archaeological research permits will promote the goals and objectives of both agencies and will better serve the public, scientific community, and other resource users. See Appendix F, which describes in detail a process whereby FKNMS staff may issue permits for archaeological research on historical resources located on Florida's state submerged lands.

If a permit applicant's proposed research and activities meets the criteria for review under Section III.B. and adheres to the permitting process outlined in Appendix F, FKNMS permits issued for archaeological research will be accepted by Florida's Division of Historical Resources (DHR) as sufficient for State purposes for authorization of archaeological research on state submerged lands of FKNMS. A separate DHR permit under Florida Administrative Code 1A-32 will not be required.

Should a permit applicant's proposed research have the potential to cause adverse effects to historic properties on state submerged lands that make it ineligible for review under Section III.B., FKNMS will advise the applicant to apply to the DHR for a permit under Florida Administrative Code 1A-32. The ONMS would then issue an authorization for the research contingent upon the applicant receiving the DHR permit.

Archaeological research permit applications seeking to conduct any disturbance to historic properties with religious and/or cultural significance to Native American tribes do not qualify for review under Section III.B. and shall require the ONMS to consult with the SHPO and tribes to ensure that the research does not adversely affect the historic properties.

IX. DISPUTE RESOLUTION

Should any signatory or concurring party to this PA object at any time to any actions proposed or the manner in which the terms of this PA are implemented, the ONMS shall consult with such party to resolve the objection. If the ONMS determines that such objection cannot be resolved, the ONMS will:

- A. Forward all documentation relevant to the dispute, including the ONMS's proposed resolution, to the ACHP. The ACHP shall provide the ONMS with its advice on the resolution of the objection within thirty (30) days of receiving adequate documentation. Prior to reaching a final decision on the dispute, the ONMS shall prepare a written response that takes into account any timely advice or comments regarding the dispute from the ACHP, signatories and concurring parties, and provide them with a copy of this written response. The ONMS will then proceed according to its final decision.
- B. If the ACHP does not provide its advice regarding the dispute within the thirty (30) day time period, the ONMS may make a final decision on the dispute and proceed accordingly. Prior to reaching such a final decision, the ONMS shall prepare a written response that takes into account any timely comments regarding the dispute from the signatories and concurring parties to the PA, and provide them and the ACHP with a copy of such written response.
- C. ONMS's responsibility to carry out all other actions subject to the terms of this PA that are not the subject of the dispute remain unchanged.

X. DURATION OF AGREEMENT

- A. This PA will become effective after execution by all Parties and will expire on December 31, 2025.
- B. The Parties will review this PA at least once every three years to determine whether it should be revised or terminated.
- C. This PA may be terminated by (1) written mutual consent, or (2) 90 days advance written notice by any Party.

XI. AMENDMENTS TO THE AGREEMENT

This PA may be amended when such an amendment is agreed to in writing by all signatories. The amendment will be effective on the date a copy signed by all of the signatories is filed with the ACHP.

The signatories may update the Points of Contact identified in Sections II.G. and II.H. without formally amending this PA.

XII. AGREEMENT TERMINATION

- A. This PA may be terminated by (1) written mutual consent, or (2) 90 days advance written notice by any Party.
- B. If any Signatory Party determines that the terms of the PA will not or cannot be carried out, that Party shall immediately consult with the other Parties to attempt to develop an amendment per Section XI, above. If within ninety (90) days an amendment cannot be reached, any Party may terminate the PA upon written notification to the other Parties.
- C. Should this agreement terminate, the ONMS must either (a) comply with 36 CFR Part 800, Subpart B, for each individual undertaking or (b) consult to determine if the Parties agree to develop a new PA, pursuant to 36 CFR § 800.14(b). The ONMS shall notify the Parties as to the course of action it will pursue.

XIII. COMPLIANCE WITH THE ANTI-DEFICIENCY ACT

NOAA’s obligations under this PA are subject to the availability of appropriated funds, and the stipulations of this PA are subject to the provisions of the Anti-Deficiency Act. NOAA shall make reasonable and good faith efforts to secure any necessary funds to implement this PA in its entirety. If compliance with the Anti-Deficiency Act alters or impairs NOAA’s ability to implement the stipulations of this PA, NOAA shall consult with the Signatory Parties in accordance with the amendment and termination procedures found in Sections XI and XII.

XIV. SIGNATORY PARTIES:

U.S. DEPARTMENT OF COMMERCE, NATIONAL OCEANIC AND ATMOSPHERIC
ADMINISTRATION, NATIONAL OCEAN SERVICE, OFFICE OF NATIONAL MARINE
SANCTUARIES

John Armor
Director, Office of National Marine Sanctuaries

DATE _____

Sarah Fangman
Superintendent, Florida Keys National Marine Sanctuary

DATE _____

FLORIDA DEPARTMENT OF STATE, DIVISION OF HISTORICAL RESOURCES, STATE
HISTORIC PRESERVATION OFFICE

Timothy A. Parsons, Ph.D.
State Historic Preservation Officer

DATE _____

THE ADVISORY COUNCIL ON HISTORIC
PRESERVATION

John M. Fowler, Executive Director

DATE _____

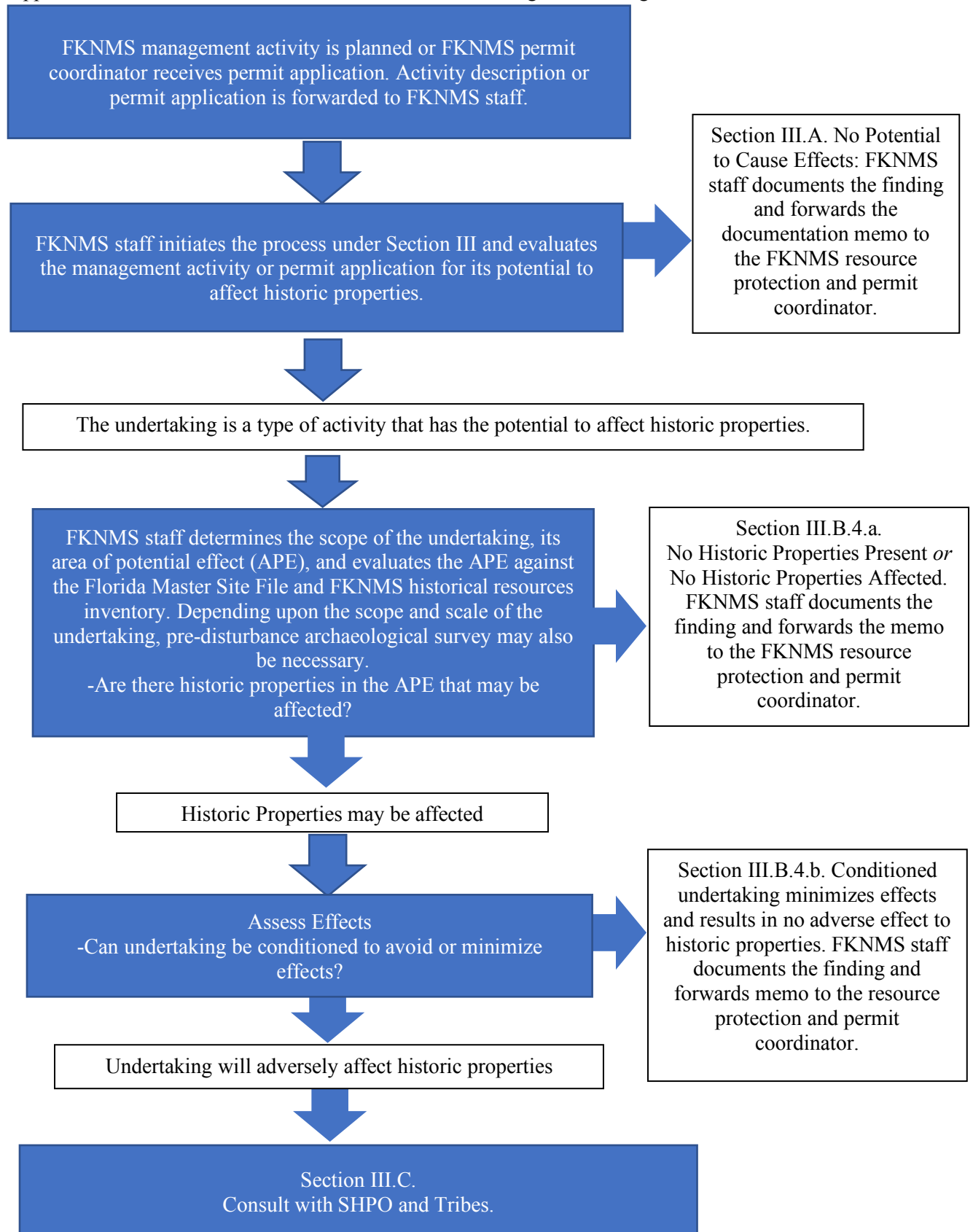
Appendix A – Area of Potential Effect (APE)



The Florida Keys National Marine Sanctuary (FKNMS or sanctuary) boundary is set forth in federal regulations at 15 CFR § 922.161 and Appendix I to Subpart P, as follows: *The Florida Keys National Marine Sanctuary consists of an area of approximately 2900 square nautical miles (9800 square kilometers) of coastal and ocean waters, and the submerged lands thereunder, surrounding the Florida Keys in Florida.*

The shoreward boundary of the sanctuary is the mean high water mark, except where the boundary is coterminous with that of the Dry Tortugas or Biscayne National Parks. The sanctuary overlaps the marine portions of several other protected areas including the Key West National Wildlife Refuge and Great White Heron National Wildlife Refuge and several state parks and aquatic preserves.

Appendix B – Flow Chart for Review Process under this Programmatic Agreement



Appendix C – FKNMS Operational and Management Activities, and FKNMS Permit Activities That Do Not Require Section 106 Consultation

The following list of activities are unlikely to affect a historic property’s National Register qualifying characteristics and thus do not require section 106 consultation. This list includes reasonable examples, but is not exhaustive. The ONMS may find that other activities not listed here are also unlikely to affect historic properties.

Research and education

- Temporarily placing small measuring and monitoring devices, weighted floats, and/or lines and related equipment.
- Operating an autonomous underwater vehicle (AUV), remotely operated vehicle (ROV) or other marine remote sensing equipment that does not physically contact historical resources or the sediment under normal operation.
- Operating an unmanned surface vehicle (USV) or unmanned aerial vehicle (UAV)
- Measuring corals and securing tags to coral formations.
- Limited coring or collection of whole or partial colonies of coral and other benthic invertebrates.
- Manipulating (non-injurious) sanctuary resources.
- Accessing restricted zones or using restricted vessel types.
- Collecting organisms in fully protected zones.
- Operating sanctuary vessels for research and educational purposes.

Mooring and boundary buoy maintenance

- Installing and maintaining moorings, boundary and marker buoys, and permanent monitoring stations where no known historical resources exist.
- Probing and/or coring the seabed to determine adequacy of the substrate for installation of moorings where no known historical resources exist.

Response and restoration

- Temporarily placing small measuring or monitoring devices, weighted floats, and/or lines and related equipment.
- Manipulating, relocating, or removing coral rubble or sediment by hand.
- Temporarily placing anchors.
- Removing debris resting on the seabed such as vessel moorings, derelict fishing gear, abandoned research equipment or markers, damaged navigational aids, hurricane debris, or debris associated with vessel groundings. Undertakings to remove debris that is heavily embedded or buried is not exempt, but may be eligible from the review process outlined in Section III.B.
- Measuring corals and securing tags to coral formations.
- Up-righting coral formations; removing or temporarily caching corals that would otherwise be destroyed or removed by disease, marine construction, research or other marine operations, or that have been generated from a grounding event; and moving, transplanting, and reattaching corals to substrate.
- Handling, touching, and manipulating coral fragments and colonies that are in temporary cache or “nursery” situations.
- Disturbing state and federally protected species.

- Removing exotic species by appropriate and necessary methods.
- Placing bird stakes, sediment, sediment tubes, and seagrass transplants in scarred or damaged areas that previously supported seagrass.
- Conducting other habitat restoration activities (e.g., mangrove restoration) in damaged areas where native species previously existed.

Enforcement

- Operating enforcement vessels.
- Returning seized sanctuary resources to their natural environment in coordination with appropriate state or federal resource agencies.

Historical resource management

- Characterizing historical resources by or under the direction of FKNMS staff. To meet the inventory mandate of section 110 of the NHPA, FKNMS staff may conduct minimally intrusive site documentation activities to include manual sediment disturbance (i.e. hand fanning), shallow, non-mechanical probing, and diagnostic artifact collection conducted under the direction of the FKNMS archaeologist.

General permits and authorizations

- Issuing research, education, or other FKNMS general permits that entail any of the activities listed above, with the exception of historical resource focused activities.
- Issuing permits to allow vessels access to the Tortugas North Ecological Reserve.
- Issuing special use permits to allow placing temporary buoys for marine events (e.g., boat races), temporarily deploying items on the sea floor for filming purposes (e.g., cameras, small props), discharging cremated human remains over waters of the sanctuary, and discharging fireworks above waters of the sanctuary.
- Issuing authorizations of another federal, state, or local agency permit to allow nearshore construction activities that are otherwise prohibited by FKNMS regulations. Such projects typically include seawall repairs, dock construction and repairs, boat ramp and boat notch construction and repairs, culvert installation, mooring piling installation, rip rap revetment construction and repairs, marina repairs including maintenance dredging, and similar, discrete construction activities that occur in the nearshore environment (typically <500 m from shore). All such activities require a permit or approval from one or more agencies with primary regulatory authority over the action, such as US Army Corps of Engineers (federal), Florida Department of Environmental Protection or the South Florida Water Management District (state), and local agencies (e.g., Monroe County or any municipality in the Florida Keys). Those agencies are responsible for evaluating the activity's effects on historic properties per section 106 of the NHPA (federal agencies) or Chapter 267 of the Florida Statutes (state agencies) prior to permitting any such activity. The FKNMS authorization represents an administrative action (secondary approval) that is required for certain activities, and does not result in additional effects to historic properties beyond those considered by the primary federal or state permitting agencies.

Appendix D – Avoidance and Minimization Measures

The ONMS will apply the following avoidance and minimization measures to activities that may affect historic properties; however, not all measures may be applicable to all categories of activities. As noted in Section III.C. of this PA, any activity that cannot be conditioned to include the applicable measures listed below and may result in adverse effects will require section 106 consultation with the SHPO and Native American tribes. Avoidance and minimization measures will be fully described and implemented through permit terms and conditions.

These avoidance and minimization measures shall be reviewed by the ONMS, and SHPO a minimum of every two years to reflect current technology, changing environmental or resource conditions, and management priorities. Updates may be approved by the FKNMS Superintendent and representatives of the SHPO as designated by those agencies.

Measures applied to avoid or minimize effects to historic properties:

- Per Section III.B.2. of this PA, the geographic area for any undertakings that involve limited ground disturbance (e.g., installation of scientific equipment, mooring buoys, etc.) shall be compared to the FKNMS historical resource inventory and Florida Master Site File to confirm there are no known historic properties present in the APE.
- If historic properties are present, an avoidance area shall be established in which no activities may occur and the activity(ies) shall be relocated to an area far enough away from the historic properties to prevent effects, based on the scope and duration of the proposed activity (e.g., relocate scientific equipment to an area outside the footprint of the historic properties).
- Activities occurring in close proximity to known historic properties shall be monitored regularly to ensure no effects to those resources. Depending upon the scale and scope of the undertaking, and particularly the amount of seafloor disturbance and proximity to historic properties, continuous archaeological monitoring may be required.
- To determine if previously unknown historic properties are located in the APE, where more extensive seafloor disturbance will occur, FKNMS staff will condition the permit to include a pre-disturbance survey appropriate in scale to the undertaking. Pre-disturbance surveys must meet Florida Division of Historical Resources Performance Standards for Submerged Remote Sensing Surveys. The survey’s scope and research design must be reviewed and approved by FKNMS staff prior to commencing survey activities.
- If prehistoric or historic artifacts, such as pottery, ceramics, projectile points, dugout canoes, metal implements, historic building materials, shipwreck structures or any other physical remains that could be associated with past human activities are encountered at any time within the project area, the project shall cease all activities that may risk injury to historic properties in the immediate vicinity of the discovery. The project manager shall contact FKNMS staff immediately and project activities that risk injury to historic properties shall not resume without written authorization from the FKNMS Superintendent.
- In the event that unmarked human remains are encountered during activities, all work shall stop immediately and the proper authorities notified in accordance with Section 872.05, Florida Statute.
- The ONMS shall ensure that any and all human remains, sacred objects, and objects of cultural patrimony discovered as a result of activities permitted by the ONMS will be treated with dignity

and respect. In order to ensure the proper treatment of Native American human remains and associated grave items and to comply with NAGPRA and implementing regulations 43 CFR Part 10, the ONMS will consult with the Seminole Nation of Oklahoma and other regional tribes on appropriate actions following discovery.

Appendix E – Annual Report Template

Undertakings meeting the criteria for review under Section III.B. of this PA will be documented and reported annually to the SHPO following this or a similar format. Three examples are provided.

Project ID#	#1
Project Name	Current meter installation
Permittee (if applicable)	NOAA National Center for Coastal and Ocean Science
Permit number (if applicable)	FKNMS-2017-123
Date review completed	1/6/2017
Category of activity*	FKNMS permit – research (P-RES)
Brief description of activity	Installation of ocean current monitoring device incl. 9 ft ² mooring plate
Geographic location of activity	Moser Channel
Historical properties present? (provide FMSF no. if applicable)	Yes, #MO12345
Avoidance or minimization measures applied (if applicable)	Mooring location shifted 200' north to avoid historical resource

Project ID#	#2
Project Name	Exploring the bronze cannon site
Permittee (if applicable)	The Bronze Cannon Team
Permit number (if applicable)	FKNMS-2017-456
Date review completed	3/12/2017
Category of activity*	FKNMS permit – archaeological research (P-ARC)
Brief description of activity	Conducting magnetometer and limited anomaly identification with manual sediment disturbance
Geographic location of activity	Within a 0.2 mile radius of 24.1234° N, 80.5678° W
Historical properties present? (provide FMSF no. if applicable)	Yes (no FMSF assigned)
Avoidance or minimization measures applied (if applicable)	Only hand fanning is permitted; no other means of disturbance authorized.

Project ID#	#3
Project Name	Habitat restoration of the <i>M/V Clueless</i> grounding site
Permittee (if applicable)	n/a
Permit number (if applicable)	n/a
Date review completed	6/30/2017
Category of activity*	FKNMS management – response and restoration (RESP)
Brief description of activity	Filling a 90 cu.-ft. depression in hard bottom habitat with a concrete and aggregate to restore stability; transplanting stony corals to the seabed
Geographic location of activity	24.1111° N, 81.2222° W
Historical properties present? (provide FMSF no. if applicable)	No
Avoidance or minimization measures applied (if applicable)	n/a

Reporting of undertakings qualifying for review under Section III(B) will also include a summary of any actions taken or data gained to further document and evaluate historical resources within the sanctuary:

E.g., On May 15, 2017, FKNMS staff obtained data collected by the Maritime Archaeological Society that definitively identified the unknown shipwreck site located at Trouble Reef, offshore of Key Largo, FL, as the wreck of the SS Shipmate, a 1882-built schooner hailing from Denmark.

*Key to categories of activities:

Activity or permit type	Abbreviation in report
FKNMS management (including education, research, general operations)	MGMT
FKNMS historical resource management	HIST
FKNMS enforcement	ENFC
FKNMS response or restoration	RESP
FKNMS permitting – archaeological research	P-ARC
FKNMS permitting – research	P-RES
FKNMS permitting – education	P-EDU
FKNMS permitting – special use	P-SUP
FKNMS permitting – authorization	P-AUT
FKNMS permitting – other general permits	P-GEN

Appendix F – Archaeological Research Permitting

Close cooperation and coordination between Florida’s Division of Historical Resources (DHR) and the ONMS are essential in allowing the agencies to carry out their respective functions and responsibilities to conserve historical resources within FKNMS. To facilitate and streamline the permitting process for archaeological research activities and Section 106 responsibilities in both state and federal waters of FKNMS, the ONMS and DHR agree to implement the following procedures for archaeological research permits that qualify for review as described in Section III.B. As explained in Section VIII., research activities that meet the criteria for review under Section III.B. of this agreement and adhere to the permitting process outlined herein will be accepted by the DHR as sufficient for its purposes for permitting of archaeological research within state waters and a separate DHR permit under Florida Administrative Code 1A-32 will not be required.

- The ONMS will require applications for archaeological research to be consistent with the standards set forth in Chapter 1A-32 of Florida’s Administrative Code.
- The ONMS will require applicants for archaeological research permits to meet the standards set forth in Chapter 1A-32 of Florida’s Administrative Code and the Secretary of the Interior’s Professional Qualification Standards.
- The ONMS will forward archaeological research permit applications that will occur in state waters to Florida’s Bureau of Archaeological Research for review and comment. If no comments are received after 30 calendar days, the ONMS may proceed with permit issuance.
- Archaeological research permits shall require all survey methodology to be consistent with the *Florida Division of Historical Resources Performance Standards for Submerged Remote Sensing Surveys* (the Standards; http://dos.myflorida.com/media/31390/remote_surveys.pdf).
- Depending upon the nature of the archaeological research proposed, the ONMS may also reference the Bureau of Ocean Energy Management’s Guidelines for Providing Archaeological and Historic Property Information pursuant to 30 CFR § 585 (https://www.boem.gov/Guidelines_for_Providing_Archaeological_and_Historic_Property_Information_Pursuant_to_30CFR585/).
- No archaeological research permits involving mechanical (e.g., dredge, prop wash deflector) bottom disturbance activities will qualify for this streamlined process.
- No archaeological research permits shall authorize manual sediment disturbance or hand fanning unless a remote sensing survey of the permit area has been completed consistent with the aforementioned Standards.
- Archaeological research permits that do authorize hand fanning and manual sediment disturbance shall be limited to minimal seafloor disturbance for the purpose of *in situ* identification. All depressions must be immediately backfilled upon completion of target identification.
- Archaeological research permits shall not authorize the movement or recovery of objects. All identifications of anomalies shall take place *in situ*.
- Archaeological research permits shall require permittees to submit a final report consistent with the Standards, Florida Administrative Code 1A-46, and ONMS reporting guidelines no later than 90 days before the permit expiration date (for renewals) to maintain a continuous permit and no later than 90 days after the permit expires (if no renewal is requested). The final report shall be submitted to the ONMS and DHR.

- Archaeological research permits shall require that permittees submit appropriate Florida Master Site File Archaeological Site and Survey Log documentation to the ONMS and DHR.
- Archaeological research permits shall require that permittees notify the ONMS when engaging in activities under their permit.
- Archaeological research permits previously issued by the ONMS for activities directed at historical resources on submerged lands under Federal jurisdiction must meet the requirements described above before they can be amended, extended, or revised to include research on submerged state lands.
- Archaeological research permits previously issued by the ONMS must meet the requirements described above to qualify for renewal of the permit.

Appendix G – Known Historical Resources or Historically-reported Vessel Losses Located in Florida Keys National Marine Sanctuary (i.e., the Area of Potential Effects)

Variety	Site Name	General Location	Year Lost	FMSF#	On Florida Submerged Lands
Located Site	140' Depth Barge	Pickles Reef	0		No
Located Site	1800s Wreck	Quicksands	0		No
Located Site	7 MB Barge Wreck	Moser Channel	0		Yes
Located Site	Acorn	Elbow Reef	1885		No
Located Site	Adelaide Baker	Coffins Patch, 4 miles SSE of Duck Key	1889	MO02536	No
Located Site	Alexander Barge	Between Crocker Reef and Alligator Reef		MO01305	No
Located Site	Alligator Light Wreck	Alligator Reef			No
Located Site	Alligator Reef Lighthouse	Alligator Reef	1873	MO01339	No
Located Site	Alligator Reef Wreck	Alligator Reef			No
Located Site	Alligator, USS (potential)	SE of Alligator Reef Light	1822	MO00173	No
Located Site	Almiranta/El Gallo Indiano	Off Long Key	1733	MO00178	Yes
Located Site	American Shoal Lighthouse	American Shoal	1880		No
Located Site	American Shoal Schooner Wreck	American Shoal	0	MO01132	Yes
Located Site	Amesbury, USS	5 miles west of Key West, Gulf side	1962		Yes
Located Site	Arbutus, USCGC	Quicksands, West of Marquesas Keys	0		No
Located Site	Bahia Honda Ballast Stone Pile	Bahia Honda	0	MO01887	Yes
Located Site	Bahia Honda Wreck	Bahia Honda Key		MO01196	Yes
Located Site	Barbara	North End of Key Largo	0	MO02050	Yes
Located Site	Barrel Wreck	Lower Matecumbe Key	0		Yes
Located Site	Benny's Wreck	Dixie Shoal	0		No
Located Site	Benwood	Between French Reef and Dixie Shoals	1942	MO02662	No
Located Site	Bibb, USCGC (Artificial Reef)	Off Molasses Reef	1987	MO01311	No

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Located Site	Bittner's Wreck	Rodriguez Key	0		Yes
Located Site	Boca Chica Ballast Pile	Boca Chica Key	0	MO02349	Yes
Located Site	Boca Chica PV-1 Aircraft	Boca Chica Key	0	MO02348	Yes
Located Site	Boca Grande Wreck - Small	Boca Grande	0		Yes
Located Site	Boca Grande Wreck - Steamer	Boca Grande	0		Yes
Located Site	Boiler Patch Steam Freighter	South of Duck Key	0		No
Located Site	BonVont Wreck	Quicksands	0		No
Located Site	Brass Wreck	Molasses Reef		MO01331	No
Located Site	Brick Barge	Hen and Chickens Reef		MO01308	Yes
Located Site	Brick Wreck	Tavernier		MO01323	Yes
Located Site	Bridge Rubble	Upper Matecumbe Key		MO01340	No
Located Site	Bronze Cannon Wreck	American Shoal			Yes
Located Site	Bronze Pin Wreck	Molasses Reef		MO01328	No
Located Site	Bronze Wreck	Turtle Shoal			Yes
Located Site	Bunn Cannon Patch	Carysfort Reef	0	MO03228	No
Located Site	Buried Ballast Wreck	Whale Harbor Bridge	0		Yes
Located Site	Cable Wreck	Dixie Shoal	0		No
Located Site	Cannabis Trawler	South of Alligator Reef		MO01303	No
Located Site	Capitana/El Rubi	Off Key Largo, near Davis Reef	1733	MO00146	No
Located Site	Carysfort Reef Lighthouse	Carysfort Reef	1852		No
Located Site	C-D Wreck	Carysfort Reef	0		No
Located Site	Cement Barrel Wreck	Pickles Reef	0		No
Located Site	Charles W. Baird	Inshore of Carysfort Reef	1930		No
Located Site	Chaves	Off Islamorada, at the intersection of Snake Creek and Hawk Channel	1733	MO00102	Yes
Located Site	City of Washington	Elbow Reef	1917	MO02663	No

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Located Site	Coin Wreck	Plantation Key	0	MO00253	Yes
Located Site	Copper Clad Wreck	Quicksands	0		No
Located Site	Copper Wreck	Carysfort Reef	0		No
Located Site	CR Wreck	Crocker Reef	0		No
Located Site	Curb, USS (Artificial Reef)	South of Key West	1983		No
Located Site	D & B Barge Wreck	Between Crocker Reef and Alligator Reef		MO01306	No
Located Site	Delta A Wreck	Delta Shoals	0		No
Located Site	Delta B Wreck	Delta Shoals	0		No
Located Site	Delta Barge	Delta Shoals	0		Yes
Located Site	Delta Shoal Steel Wreck	Southwest Delta Shoals			No
Located Site	Disgusting Wreck/Gudgeon Wreck	Vicinity of Rodriquez Key		MO01321	Yes
Located Site	Dixie Shoals Cannon Patch	Dixie Shoals	0	MO03274	No
Located Site	Dominguez Wreck	Quicksands	0		No
Located Site	Duane, USCGC (Artificial Reef)	Off Molasses Reef	1987	MO01310	No
Located Site	Eagle (Artificial Reef)	3 miles northeast of Alligator Reef Light	1985	MO01304	No
Located Site	El Infante/N. S. de Balvenada	Little Conch Reef	1733	MO00092	No
Located Site	El Sueco de Arizon	Off Conch Key	1733	MO00132	Yes
Located Site	El Terri/San Felipe	Off Lower Matecumbe Key	1733	MO00133	Yes
Located Site	Elbow Ballast Wreck	Elbow Reef	0		No
Located Site	Eurisco Wreck	Off Alligator Reef	0		No
Located Site	Excelsior	French Reef	1879		No
Located Site	F.H.S.T. Wreck	French Reef	0		No
Located Site	Fishing Camp Foundation	Upper Matecumbe Key		MO01309	Yes
Located Site	FKNMS W02FR	French Reef	0	MO03398	No
Located Site	Flagler Shipping Docks	Marathon End of 7 Mile Bridge	1906		Yes

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Located Site	Fleming Key Wreck	Fleming Key	0	MO02158	Yes
Located Site	Fly, HMS	Shoreward side of Little Conch Reef	1805	MO01326	No
Located Site	Gear Wreck	Pickles Reef	0		No
Located Site	Granite Block	Conch Reef	0		No
Located Site	Granite Block Barge	French Reef	0		No
Located Site	Granite Wreck	Conch Reef		MO00148	Yes
Located Site	Grassy Key Bronze Pin Wreck	Grassy Key		MO01879	Yes
Located Site	Grassy Key Canoe	Grassy Key	0	MO03448	Yes
Located Site	Gudgeon Wreck	Inshore Pickles Reef	0		Yes
Located Site	Guerrero (Potential)	Turtle Reef/Ocean Reef	1827	MO02343	Yes
Located Site	Halas Ballast	Carysfort Reef	0		No
Located Site	Hannah M. Bell	On Elbow Reef	1911	MO02353	No
Located Site	Hawk Channel Schooner Wreck	South of Rodriquez Key	0	MO01320	Yes
Located Site	Herrera/N. S. de Belem y San Antonio de Padua	East of Matecumbe Key	1733	MO00090	Yes
Located Site	Honey Dipper Wreckage	Pickles Reef	0		No
Located Site	Horseshoe Reef Wreck	Horseshoe Reef	0		No
Located Site	Indian Key Anchorage	Indian Key		MO01335	Yes
Located Site	Indian Key Wreck	Indian Key		MO01327	Yes
Located Site	Iron Ballast Wreck 1	Near Pickles Reef		MO00151	No
Located Site	Iron Bar Wreck	Watson's Reef	0		No
Located Site	Iron Mast	Crocker Reef	0		No
Located Site	Iron Masted Schooner	Between Alligator Reef and Crocker Reef		MO01324	No
Located Site	Ivory Wreck	Delta Shoals		MO00136	No
Located Site	Kearns Wreck	Tavernier Key		MO01334	Yes
Located Site	Kerns Wreck	Conch Reef	0		No

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Located Site	Key Colony Beach Brick Wreck	Off Marathon		MO01881	Yes
Located Site	Kimbel's Wreck	Tavernier Harbor	0		Yes
Located Site	Knight Key Pier	Knight Key		MO00140	Yes
Located Site	Laddy's Wreck	White Bank	0		No
Located Site	Little Conch Reef Wreck	Tavernier Key			Yes
Located Site	Liz's Wreck	White Bank Dry Rocks	0		No
Located Site	Long Key Dock Piers	Long Key	0	MO01472	Yes
Located Site	Loo, HMS	Looe Key	1744	MO00199	No
Located Site	LST Target Ship	West of Marquesas Keys	1948		No
Located Site	M-13 Wreckage	Molasses Reef	0		No
Located Site	Maitland Wreck I	Carysfort Reef	0		No
Located Site	Maitland Wreck II	Carysfort Reef	0		No
Located Site	Marie J. Thompson	Key West area	1935		Yes
Located Site	Marker 39 Shipwreck	Tavernier	0	MO01931	Yes
Located Site	Marker 39 Wreck	Rodrigues Key	0		Yes
Located Site	MAST	Dixie Shoal	0		No
Located Site	Mast Wreck	French Reef	0		No
Located Site	Menemon Sanford	3 miles from Carysfort Reef Light, outer side of reef.	1862	MO02342	No
Located Site	Metal Wreck	Little Conch Reef	0		No
Located Site	Muir Wreck	Boca Chica Key		MO01448	Yes
Located Site	Mystery Wreck	Key Colony Beach		MO00143	Yes
Located Site	NFR Wreck Site	French Reef	0		No
Located Site	Nickerson Wreck	Grecian Rocks	0		No
Located Site	Nimble, HMS, Anchor (Potential)	Turtle Reef/Ocean Reef	1827	MO02345	Yes
Located Site	Nimble, HMS, Ballast (Potential)	Turtle Reef/Ocean Reef	1827	MO02344	Yes

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Located Site	NN Wreck	Cannon Patch Reef, JPCRSP		MO00144	Yes
Located Site	NN Wreck	Little Conch Reef		MO00150	No
Located Site	NN Wreck	Loggerhead Key, Dry Tortugas		MO00181	Yes
Located Site	NN Wreck	Indian Key		MO00149	Yes
Located Site	NN Wreck	Sombrero Key		MO00138	No
Located Site	NN Wreck	East of Looe Key		MO00174	No
Located Site	NN Wreck	Man Key		MO00145	Yes
Located Site	NN Wreck	Mooney Harbor Key, Marquesas Keys		MO00256	Yes
Located Site	NN Wreck	Loggerhead Key, Dry Tortugas		MO00182	Yes
Located Site	North America	Delta Shoal, just east of Sombrero Light	1842		Yes
Located Site	Northeast Ballast Wreck	Molasses Reef	0		No
Located Site	Northern Light	Off Elbow Reef	1930		No
Located Site	Nuestra Senora de Atocha	Marquesas Keys	1622		No
Located Site	NW Turtle Wreck	Turtle Reef	0		Yes
Located Site	Ore Ballast Wreck	Pickles Reef		MO01332	No
Located Site	Penny's Wreck	Conch Reef	0		Yes
Located Site	Pickles Bar Wreck	Pickles Reef	0		No
Located Site	Pickles Rib Wreck	Pickles Reef	0		No
Located Site	Pigeon Key Railroad Wreck	Pigeon Key		MO01195	Yes
Located Site	Pigeon Key Wreck	Narrow Channel, Northeast side of Pigeon Key	1906		Yes
Located Site	Pillar Coral Wreck	Pickles Reef	0		No
Located Site	Porter Anchor Wreck	Dixie Shoal	0		No
Located Site	Pyramid Wreck	Carysfort Reef	0		No
Located Site	Queen of Nassau	Off Alligator Reef		MO03620	No
Located Site	Real Kearns Wreck	Conch Reef	0		Yes

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Located Site	Rebecca Shoal Iron Wreckage	Dry Tortugas			No
Located Site	Reef Beacon A	Eastern Sambo	0		No
Located Site	Reef Beacon at Coffins Patch	Coffins Patch	0		No
Located Site	Reef Beacon B	American Shoal	0		No
Located Site	Reef Beacon D	Crocker Reef	0		No
Located Site	Reef Beacon E	Conch Reef	0		No
Located Site	Reef Beacon F	Pickles Reef	0		No
Located Site	Reef Beacon G	French Reef	0		No
Located Site	Reef Beacon I	Elbow Reef	0		No
Located Site	Reef Beacon K	Turtle Reef	0		No
Located Site	Rib Wreck	Vaca Kley		MO01880	Yes
Located Site	Ribs Bare Wreck	Fleming Key			Yes
Located Site	Ridge Wreck	Carysfort Reef	0		No
Located Site	R-J Wreck	Carysfort Reef	0		No
Located Site	Rodriquez Key/Rock Harbor Anchorage	Rodriquez Key		MO01338	Yes
Located Site	Rosalee	Plantation Key		MO01312	Yes
Located Site	Ruiz Wreckage	Alligator Reef	0		Yes
Located Site	Rum Runner Wreck	Vicinity of Rodriquez Key		MO01322	Yes
Located Site	S-16	14 Miles South Southwest of Key West	1944		No
Located Site	San Fernando	Coffins Patch	1733	MO00137	Yes
Located Site	San Francisco	Off Long And Craig Keys	1733	MO00091	Yes
Located Site	San Jose y Las Animas	Off Tavernier Key	1733	MO00101	Yes
Located Site	San Pedro	Off Lower Matecumbe Key	1733	MO00104	Yes
Located Site	San Rafael/N. S. de las Angustias	Long Key Channel	1733	MO00131	Yes
Located Site	Sand Key Lighthouse	Sand Key	1853		Yes

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Located Site	Santa Margarita	Quicksands	1622	MO03397	No
Located Site	Scattered Pickles Reef Wreckage	Pickles Reef		MO01333	No
Located Site	Schooner Wreck	Molasses Reef		MO01329	No
Located Site	Seal's Wreck	French Reef	0		No
Located Site	Shallow Wreck	Pickles Reef	0		No
Located Site	Sheen Wreck	Tavernier Harbor	0		Yes
Located Site	Sheen Wreck	Alligator Reef	0		Yes
Located Site	Shot Wreck	East Delta Shoals, Sombrero Light	0	MO00135	No
Located Site	Shrimp Boat Wreck	Dry Tortugas	0	MO00172	Yes
Located Site	Shrimp Boat Wreck	Delta Shoal	0		No
Located Site	Small Reef Wreck	Carysfort Reef	0		No
Located Site	Snake Creek Anchor	Snake Creek, Plantation Key		MO01902	Yes
Located Site	Sombrero Key Lighthouse		1858		No
Located Site	South Carysfort Wreck	Carysfort Reef	0		No
Located Site	South Turtle Wreck	Turtle Reef	0		No
Located Site	Southwest Channel Wreck	Inshore Carysfort Reef	0		No
Located Site	Southwest Wreckage	Molasses Reef	0		No
Located Site	Spiney Oyster Barge	Crocker Reef		MO01307	No
Located Site	Tavernier Key/Planter Anchorage	Tavernier Key		MO01337	Yes
Located Site	Tea Table Anchorage	Tea Table Key		MO01336	Yes
Located Site	Tennessee Wreck	Tennessee Reef	0		No
Located Site	Thiorva	Turtle Reef	1894		No
Located Site	Thompson Turtle Kralls	Key West	0	MO01467A	Yes
Located Site	Three Sisters Wreck	Molasses Reef	0		No
Located Site	Thunderbolt (Artificial Reef)	4 miles south of Key Colony Beach	1986	MO02516	No

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Located Site	Tonawanda	Elbow, Grecian Shoals	1866		No
Located Site	Tres Puentes/N. S. de Belem y San Juan Bautista	Off Upper Matecumbe Key	1733	MO00177	Yes
Located Site	U-2513	23 Miles Northeast of the Dry Tortugas	1951		No
Located Site	Unidentified Shipwreck A	Conch Reef		MO01313	No
Located Site	Unidentified Shipwreck B	Tavernier Key		MO01314	Yes
Located Site	Unidentified Shipwreck C	Pickles Reef		MO01315	No
Located Site	Unidentified Shipwreck D	Pickles Reef		MO01316	No
Located Site	Unidentified Shipwreck E	Alligator Reef		MO01317	No
Located Site	Unidentified Shipwreck F	Upper Matecumbe Key		MO01318	Yes
Located Site	Unidentified Shipwreck G	Windley Key		MO01319	Yes
Located Site	Unidentified Wreck	Ocean side of Grassy Key	0		Yes
Located Site	Vaca Cay Ballast Mound	Vaca Key			Yes
Located Site	Vertical Pin Wreck	Molasses Reef	0		No
Located Site	Vitric	Southeast of Molasses Reef	1944		No
Located Site	Wall Ballast	White Bank	0		No
Located Site	Watson's Wreck	Watson's Reef	0		No
Located Site	Welberry Wreck	Windley Key		MO01325	Yes
Located Site	Wellwood Ballast Wreck	Molasses Reef	0		No
Located Site	West Turtle Shoals Wreck	Coffins Patch area, on West Turtle Shoals		MO00142	Yes
Located Site	White Bank Dry Rocks Wreck	White Bank	0		No
Located Site	Winch Hole	Molasses Reef	0		No
Located Site	Winchester, HMS	Carysfort Reef, Off Key Largo	1695		No
Located Site	Windlass Wreck	Molasses Reef		MO01330	No
Located Site	Windlass Wreck	Molasses Reef	0		No
Located Site	Windlass Wreck	Off Key Colony Beach	0		Yes

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Located Site	Wreck 12	Delta Shoals		MO00134	No
Reported Shipwreck	A. Hayford	Dry Tortugas	1905		
Reported Shipwreck	Abbie Carson	Off Key West	1876		
Reported Shipwreck	Abby Amelia	Dry Rocks	1846		
Reported Shipwreck	Acasta	Dry Tortugas	1818		
Reported Shipwreck	Ada	Pickles Reef	1843		
Reported Shipwreck	Ada Eliza	Rodriguez Key	1841		
Reported Shipwreck	Adam W. Spies	40 miles west of Stirrup Key	1906		
Reported Shipwreck	Adams	Loo Key	1855		
Reported Shipwreck	Adelaide	On Pickles Reef	1894		
Reported Shipwreck	Adelayda	Elbow Reef	1863		
Reported Shipwreck	Admiral Pleville	French Reef	1859		
Reported Shipwreck	Affleck	Tortugas Islands	1841		
Reported Shipwreck	Agamemnon	Grecian Shoal	1858		
Reported Shipwreck	Agenora	Carysfort Reef	1836		
Reported Shipwreck	Aguilla; Aguila	On Pickles Reef; Southwest part of French Reef	1871		
Reported Shipwreck	Aitaha	Carysfort Reef	1844		
Reported Shipwreck	Ajax	Eastern end of Carysfort Reef, near Caesar's Creek	1836		
Reported Shipwreck	Alasco	Conch Reef	1842		
Reported Shipwreck	Albert Meyer	Marquesas Keys	1927		
Reported Shipwreck	Alex Harding	Gulf Stream	1883		
Reported Shipwreck	Alexander	Florida Keys	1763		
Reported Shipwreck	Alexander	Keys Gulf of Florida	1752		
Reported Shipwreck	Alexandria	Florida Keys	1763		
Reported Shipwreck	Alfred	Carysfort/Basin Shoal	1837		

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Reported Shipwreck	Allie H. Belden	Gulf Stream	1882		
Reported Shipwreck	Alligator, USS	Alligator Reef	1822		
Reported Shipwreck	Alma	French Reef	1856		
Reported Shipwreck	Almiranta de Honduras	Florida Keys	1632		
Reported Shipwreck	Aluida	Carysfort Reef	1844		
Reported Shipwreck	Alwilda (sp?)	Carysfort Reef	1844		
Reported Shipwreck	Amanda	Dry Rocks	1863		
Reported Shipwreck	Amason (also Amazon)	Dry Rocks	1872		
Reported Shipwreck	Amelia	Three miles from Key West	1914		
Reported Shipwreck	America	Dry Tortugas	1836		
Reported Shipwreck	America	American Shoal	1885		
Reported Shipwreck	Americano	Florida Keys	1814		
Reported Shipwreck	Amiable Gertrudes	Caesar's Creek	1834		
Reported Shipwreck	Amisia/Amisa	Conch Reef	1872		
Reported Shipwreck	Amos Watchilt	Key West	1830		
Reported Shipwreck	Amulet	On Pickles Reef	1831		
Reported Shipwreck	Ana Agustina/El Gran Poder de Dios y Santa Ana	Matecumbe Key	1733		
Reported Shipwreck	Andrew Jackson	Key West	1942		
Reported Shipwreck	Androis	Conch Reef	1837		
Reported Shipwreck	Andromache	Florida Keys	1805		
Reported Shipwreck	Andromache	Florida Keys	1823		
Reported Shipwreck	Angela	Agamemnon Reef, Southeast of Key West	1866		
Reported Shipwreck	Angeline	Basin Bank, Carysfort Reef	1854		
Reported Shipwreck	Anie of Scarbro (sic)/Annie of Scarborough	Florida Keys	1819		

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Reported Shipwreck	Ann & Elizabeth	Florida Keys	1774		
Reported Shipwreck	Ann Flood	Alligator Reef	1846		
Reported Shipwreck	Ann Harley	Loggerhead Shoal	1858		
Reported Shipwreck	Ann Johnson	Crocker Reef	1843		
Reported Shipwreck	Ann of London	East Florida Keys	1822		
Reported Shipwreck	Ann Washburn	Loo Key	1858		
Reported Shipwreck	Anna M. Stammer	Duck Key	1906		
Reported Shipwreck	Anna Theresa	Florida Keys	1768		
Reported Shipwreck	Annadale	Conch Reef	1865		
Reported Shipwreck	Annie Baldwin	Conch Reef	1865		
Reported Shipwreck	Annita Damon	Pickles Reef	1852		
Reported Shipwreck	Anson	Key Vacas	1843		
Reported Shipwreck	Apollo	Cape of Florida	1790		
Reported Shipwreck	Apphia & Amelia	American Shoals	1897		
Reported Shipwreck	Aquilla/Aquila/Aquilo	Southwest Part of French Reef	1871		
Reported Shipwreck	Arago	East Sambo Key	1928		
Reported Shipwreck	Arcadia	Dry Tortugas	1893		
Reported Shipwreck	Ardell	Long Key	1892		
Reported Shipwreck	Arietas	Dry Tortugas	1886		
Reported Shipwreck	Arthur	Dry Tortugas	1887		
Reported Shipwreck	Athalia	On Western Dry Rocks	1854		
Reported Shipwreck	Athenaise	Southwest point of the Quicksands	1876		
Reported Shipwreck	Atlanta	Carysfort Reef	1845		
Reported Shipwreck	Atlanta	Dry Tortugas	1865		
Reported Shipwreck	Atlantic	Carysfort Reef	1844		

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Reported Shipwreck	Atlas	Gulf of Florida, Florida Keys	1816		
Reported Shipwreck	Aurora	Southwest Reef of Tortugas	1879		
Reported Shipwreck	Austulitz	Pickles Reef	1837		
Reported Shipwreck	B. F. Neally	Alligator Reef	1890		
Reported Shipwreck	Bagdad	Key West	1921		
Reported Shipwreck	Bahama	Carysfort Reef	1835		
Reported Shipwreck	Baldomero Iglesias	Florida Reef	1889		
Reported Shipwreck	Barilla	Florida Keys	1819		
Reported Shipwreck	Barley Wreck	Quicksands, West of Marquesas Keys	0		
Reported Shipwreck	Bayronto	Off Key West	1919		
Reported Shipwreck	Beatrice	Dry Tortugas	1895		
Reported Shipwreck	Bell Hooper	Southwest Reef Tortugas	1890		
Reported Shipwreck	Belle	French Reef	1857		
Reported Shipwreck	Belle	Sugarloaf Key	1836		
Reported Shipwreck	Ben Cushing	French Reef	1862		
Reported Shipwreck	Benjamin Burgess	Elbow Reef	1858		
Reported Shipwreck	Benjamin Hale	On Bird Key Shoals	1893		
Reported Shipwreck	Benjamin Litchfield	Near the Lightship at Sand Key	1848		
Reported Shipwreck	Bertrana (sp?)	Dry Rocks	1844		
Reported Shipwreck	Betsey	Florida Keys	1818		
Reported Shipwreck	Big Pine Key Wreck	Big Pine Key			
Reported Shipwreck	Billander Betty	Looe Key	1744		
Reported Shipwreck	Billow	Dry Tortugas	1837		
Reported Shipwreck	Birginia 3	Boca Chica	1910		
Reported Shipwreck	Blakely	Carysfort Light	1835		

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Reported Shipwreck	Bosiljka (Y.S.)	Several miles North-Northwest of Key West and North-Northeast of Marquesas	1942		
Reported Shipwreck	Brandt	Carysfort Reef	1817		
Reported Shipwreck	Branganza	Near Key West	1909		
Reported Shipwreck	Brazos	Dry Tortugas	1917		
Reported Shipwreck	Bridesmaid	Tennessee Reef	1890		
Reported Shipwreck	Brig	Florida Keys	1819		
Reported Shipwreck	Brilliant	Carysfort Reef	1858		
Reported Shipwreck	Britannia	Florida Keys	1803		
Reported Shipwreck	Britannia	Conch Reef	1829		
Reported Shipwreck	Brunette	Long Key Bar	1861		
Reported Shipwreck	Byron	Triangle Shoal	1854		
Reported Shipwreck	C. C. Fowler	Washerwoman Shoal	1859		
Reported Shipwreck	C. D. Ellis	Alligator Reef	1846		
Reported Shipwreck	C. W. Wells	35 Miles South-Southwest of Dry Tortugas	1921		
Reported Shipwreck	C. Whiting	Carysfort Reef, West of lighthouse	1865		
Reported Shipwreck	Cabinet	Florida Reef	1811		
Reported Shipwreck	Caldwell H. Colt	Dry Tortugas	1922		
Reported Shipwreck	California	Little Conch Reef	1854		
Reported Shipwreck	Calliope	Florida Keys	1804		
Reported Shipwreck	Canton	Dry Tortugas	1848		
Reported Shipwreck	Capitana	Florida Keys	1623		
Reported Shipwreck	Caraquena	Sandbornes or West Sambos, near Key West.	1858		
Reported Shipwreck	Carmalita Composite	Dry Tortugas	1893		
Reported Shipwreck	Caroline	Caesar's Reef	1838		
Reported Shipwreck	Caroline	Key West	1842		

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Reported Shipwreck	Caroline Nesmith	Western Carysfort Reef	1865		
Reported Shipwreck	Carondelet/Carondalett	Florida Reef	1877		
Reported Shipwreck	Carrie S. Allen	Key West	1923		
Reported Shipwreck	Carysford, HMS	Carysfort Reef	1793		
Reported Shipwreck	Cashier	Carysfort Reef	1844		
Reported Shipwreck	Catherine Green	Florida Keys	1794		
Reported Shipwreck	Cavaliere Ivanissiveck	Quicksands	1889		
Reported Shipwreck	Cay	Near Matacumbe Key	1775		
Reported Shipwreck	Ceres	Dry Tortugas	1824		
Reported Shipwreck	Cerro Gordo	Loggerhead Reef	1860		
Reported Shipwreck	Cetewajo	Entrance of SE Channel near Loggerhead Light, Tortugas	1885		
Reported Shipwreck	Challenge	Carysfort Reef	1844		
Reported Shipwreck	Charles Miller	Elbow Reef	1862		
Reported Shipwreck	Charles R. Campbell	Dry Tortugas	1886		
Reported Shipwreck	Charles the Fifth	Carysfort Reef	1842		
Reported Shipwreck	Chili	French Reef	1837		
Reported Shipwreck	Cimbrus	Dry Rocks	1853		
Reported Shipwreck	City of Houston	Approximately 12 Miles From Key West, on the Shoals near Saddle Bunches	1876		
Reported Shipwreck	City of Waco	Florida Reef	1875		
Reported Shipwreck	Claudine	Florida Reef	1841		
Reported Shipwreck	Clifford N. Carver	Tennessee Reef	1913		
Reported Shipwreck	Clyde	Tavernier	1897		
Reported Shipwreck	Col. T. Sheppard	Key West	1843		
Reported Shipwreck	Colony	Coffins Patch	1853		
Reported Shipwreck	Columbia	Carysfort Reef	1856		

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Reported Shipwreck	Columbia	At Crayfish Key, Key West	1841		
Reported Shipwreck	Commisary	Key West	1846		
Reported Shipwreck	Concord	Conch Reef	1837		
Reported Shipwreck	Concord	Tortugas Reef	1831		
Reported Shipwreck	Concordia	At Vaca Key	1855		
Reported Shipwreck	Confederate	French Reef	1871		
Reported Shipwreck	Conservative	Long Key Reef	1844		
Reported Shipwreck	Coot	North of Rebecca Shoal	1942		
Reported Shipwreck	Cora Nelly	Florida Keys, Possibly Carysfort	1840		
Reported Shipwreck	Cordelia	Loo Choo Key	1860		
Reported Shipwreck	Cornwall	Ajax Reef	1873		
Reported Shipwreck	Cosmopolite	Florida Keys	1821		
Reported Shipwreck	Cossack	Florida Keys	1816		
Reported Shipwreck	Courier	Davis Reef	1853		
Reported Shipwreck	Courier	Knights Key	1836		
Reported Shipwreck	Courier de Tampico	French Shoals	1838		
Reported Shipwreck	Croton	Grecian Shoals	1865		
Reported Shipwreck	Culdoon	Near Carysfort Light	1900		
Reported Shipwreck	Curler	Southwest Key in the Marquesas	1894		
Reported Shipwreck	Curreo No. 1/Correrro/Curreo	Carysfort Reef	1829		
Reported Shipwreck	Cushnoc	Off Cape Florida	1853		
Reported Shipwreck	Cynthiana	Key West	1927		
Reported Shipwreck	Cyrus Fossett	Inside French Reef	1875		
Reported Shipwreck	Dahlia	Pickles Reef	1865		
Reported Shipwreck	Daniel Moloney/Daniel Molony	French Reef	1854		

Reported Shipwreck	Darin	Dry Rocks	1857		
Reported Shipwreck	Delores Ucarte	Alligator Reef	1869		
Reported Shipwreck	Deodueus	Molasses Reef	1876		
Reported Shipwreck	Desdemona	Looe Key	1848		
Reported Shipwreck	Despatch	Carysfort Reef	1817		
Reported Shipwreck	Diadem	Looe Key	1856		
Reported Shipwreck	Diana	Cape Florida	1774		
Reported Shipwreck	Director	Elbow Reef	1862		
Reported Shipwreck	Dolcouth	North Key Spit, Tortugas	1883		
Reported Shipwreck	Dolphin	Gulf of Florida	1752		
Reported Shipwreck	Doris	Carysfort Reef	1831		
Reported Shipwreck	Dorothy Foster	on Pickles Reef; b/t Pickles and Conch Reefs	1836		
Reported Shipwreck	Dumfries	Dry Tortugas	1831		
Reported Shipwreck	Dwight	Eastern Dry Rocks	1865		
Reported Shipwreck	E. G. Willard	Long Key	1853		
Reported Shipwreck	E. J. Bullock	Southwest of Dry Tortugas	1938		
Reported Shipwreck	E. J. Waite	Little Pelican Shoals	1886		
Reported Shipwreck	E. K. Brown	Riding Rocks	1871		
Reported Shipwreck	E. Thornton	Carysfort Reef	1847		
Reported Shipwreck	Eagle	Maranzie Reef	1801		
Reported Shipwreck	Eagle Boat, USS	3 Nautical Miles North of Marquesas Keys	1948		
Reported Shipwreck	Eben Preble	Probably in the Lower Keys	1846		
Reported Shipwreck	Edda	Straits of Florida	1891		
Reported Shipwreck	Edith	West of Key West	1877		
Reported Shipwreck	Edmund & George	Cape Florida	1790		

Reported Shipwreck	Edna Louise	30 miles from Key West	1914		
Reported Shipwreck	Edward S. Luckenbach	30 miles North of Key West	1942		
Reported Shipwreck	Edward T. Stotesbury	Knight's Key	1910		
Reported Shipwreck	Eglantine	French Reef	1858		
Reported Shipwreck	El Nauva Victoriosa	Off Key Largo	1771		
Reported Shipwreck	Eleanor	Alligator Reef	1838		
Reported Shipwreck	Eleanor	On the Tortugas	1836		
Reported Shipwreck	Elenora	Southwest Reef, Tortugas	1885		
Reported Shipwreck	Eliza	Carysfort Reef	1818		
Reported Shipwreck	Eliza	Rodriquez Key	1853		
Reported Shipwreck	Eliza Plummer	Probably the Lower Keys	1832		
Reported Shipwreck	Eliza W. Dalton	Struck Bird Key but taken to Long Cay	1855		
Reported Shipwreck	Elizabeth	Near Carysfort lightship	1847		
Reported Shipwreck	Elizabeth	Little Conch Reef	1848		
Reported Shipwreck	Elizabeth	76 Nautical Miles North of Key West	1935		
Reported Shipwreck	Elizabeth Bruce	Elbow Reef/Carysfort Reef	1854		
Reported Shipwreck	Ella Hand	Stirrup Key	1838		
Reported Shipwreck	Emery	Carysfort Reef	1840		
Reported Shipwreck	Emigrant	Alligator Reef	1856		
Reported Shipwreck	Emilie	8 Miles South-Southwest of the Northwest Light, Key West	1877		
Reported Shipwreck	Emma	Alligator Reef	1866		
Reported Shipwreck	Emma Eliza	Cudjoe Key	1909		
Reported Shipwreck	Energia	Molasses Reef, Western End	1877		
Reported Shipwreck	English County	Florida Keys	1782		
Reported Shipwreck	English Merchant Ship	American Shoals			

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Reported Shipwreck	English Ship	Florida Keys	1782		
Reported Shipwreck	Erickson	Key West area			
Reported Shipwreck	Espiritu Santa El Mayor	Florida Keys	1623		
Reported Shipwreck	Euphrasia	Pickles Reef	1848		
Reported Shipwreck	Eureka II	Cape Florida	1930		
Reported Shipwreck	Europa	Florida Keys	1817		
Reported Shipwreck	Evandale	French Reef	1875		
Reported Shipwreck	Eveline	Near Key West	1874		
Reported Shipwreck	Evenly	Florida Keys	1788		
Reported Shipwreck	Evenly	Florida Keys	1803		
Reported Shipwreck	Evenly	Florida Keys	1943		
Reported Shipwreck	Excelsior	Grecian Shoals near Carysfort Light	1880		
Reported Shipwreck	Exchange	Off Key West on Reef	1846		
Reported Shipwreck	Exerton	Dry Tortugas	1831		
Reported Shipwreck	Exit	Black Caesar's Creek	1835		
Reported Shipwreck	Export	Caesar's Reef	1838		
Reported Shipwreck	F. A. Kilburn	American Shoal Light	1918		
Reported Shipwreck	Fannie and Fay	Dry Tortugas	1925		
Reported Shipwreck	Fanny	Carysfort Reef	1835		
Reported Shipwreck	Fanny A. Everett	American Shoals	1853		
Reported Shipwreck	Fernandia	Elbow Key	1860		
Reported Shipwreck	Feronia	Windward side of Conch Reef	1845		
Reported Shipwreck	Feronia/Fernonia	Carysfort Reef	1845		
Reported Shipwreck	Fischer, Robins, Clause	Dry Tortugas			
Reported Shipwreck	Fish Plates	Alligator Reef	1871		

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Reported Shipwreck	Flora	Florida Keys	1798		
Reported Shipwreck	Flora	Florida Keys	1789		
Reported Shipwreck	Flora	Dry Tortugas	1836		
Reported Shipwreck	Flora	Dry Rocks	1848		
Reported Shipwreck	Flora Woodhouse	French Reef	1886		
Reported Shipwreck	Florence	Tortugas	1831		
Reported Shipwreck	Florence Rogers	West of Alligator Reef Light Station near Indian Key	1875		
Reported Shipwreck	Floria	Dry Rocks	1848		
Reported Shipwreck	Florida	Florida Reef	1831		
Reported Shipwreck	Florida	Key West	1909		
Reported Shipwreck	Florida	Dry Tortugas	1910		
Reported Shipwreck	Floridana	Cayo De Vivoras	1777		
Reported Shipwreck	Folomer	Southwest Reef, Tortugas	1881		
Reported Shipwreck	Fomento	North part of reef	1848		
Reported Shipwreck	Forrest	A Reef located one days sailing out of Key West	1838		
Reported Shipwreck	Frances	Alligator Reef	1846		
Reported Shipwreck	Frances and Lucy/Francis and Lucy	Florida Keys	1822		
Reported Shipwreck	Francis	Alligator Reef	1846		
Reported Shipwreck	Francis	Dry Rocks	1856		
Reported Shipwreck	Francis Ashby	At Loggerhead Key (American Shoals)	1843		
Reported Shipwreck	Franklin	on Pickles Reef	1836		
Reported Shipwreck	Franklin	Florida Keys	1823		
Reported Shipwreck	Franklin	Pickles Reef	1836		
Reported Shipwreck	Franklin	Conch Reef	1861		
Reported Shipwreck	Freddie L. Porter	Dry Tortugas	1887		

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Reported Shipwreck	Freddie W. Alton	The Dock at Key West	1909		
Reported Shipwreck	Freighter	Carysfort Reef	1849		
Reported Shipwreck	Fuerte	Dry Tortugas, Lost Near HMS Tyger	1742		
Reported Shipwreck	Galaxy	Dry Tortugas	1831		
Reported Shipwreck	Galveston	Conch Reef	1851		
Reported Shipwreck	Galveston	Duck Key	1876		
Reported Shipwreck	Ganymede	3/4 mile from Matacumbe island	1850		
Reported Shipwreck	Garden Pike	Sugar Loaf Key			
Reported Shipwreck	General Clark	Florida Keys	1793		
Reported Shipwreck	General Conway	Florida Keys	1766		
Reported Shipwreck	General Jackson	Cape Florida	1819		
Reported Shipwreck	General Taylor	Carysfort Reef	1850		
Reported Shipwreck	General Wilson	Key West	1846		
Reported Shipwreck	George Cromwell	Crocker Reef	1867		
Reported Shipwreck	George Cromwell	Lower Florida Keys	1872		
Reported Shipwreck	George III	Carysfort Reef	1824		
Reported Shipwreck	George Peabody	American Shoals	1878		
Reported Shipwreck	Georges	Molasses Reef	1876		
Reported Shipwreck	Georgianna	Carysfort Reef	1845		
Reported Shipwreck	Gettysburg	Looe Key	1873		
Reported Shipwreck	Gilbert	Carysfort Reef	1847		
Reported Shipwreck	Gladiator	Looe Key	1867		
Reported Shipwreck	Glamo	Marquesas Reef	1905		
Reported Shipwreck	Godfrey Keebler	Florida reefs	1876		
Reported Shipwreck	Golconda	American Shoal, 30 miles East of Key West	1869		

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Reported Shipwreck	Goloenk	Entrance to southeast channel, Key West	1956		
Reported Shipwreck	Governor Morton	Little Conch Reef	1860		
Reported Shipwreck	Governor Troup/Shroup	Davis Shoals	1874		
Reported Shipwreck	Grace Clark	At Grand Key during a Norther	1852		
Reported Shipwreck	Grace Deering	Miami	1906		
Reported Shipwreck	Grace Redpath	Davis Reef	1871		
Reported Shipwreck	Grecian	Carysfort Reef	1836		
Reported Shipwreck	Greenville Packet	Dry Tortugas	1765		
Reported Shipwreck	Gulfstate	33 Nautical Miles Southeast of Long Key	1943		
Reported Shipwreck	Gunvor	23 Nautical Miles North Key West	1942		
Reported Shipwreck	Gutenberg	SE of Bird Key, Tortugas	1885		
Reported Shipwreck	H. H. Conway	Off Boot Key	1944		
Reported Shipwreck	H. W. Stafford	Key West	1846		
Reported Shipwreck	Halcyon	Florida Reef	1877		
Reported Shipwreck	Hamilton	Ajax Reef	1780		
Reported Shipwreck	Hannibal of Liverpool	Elbow Reef	1890		
Reported Shipwreck	Hanover	Caesar's Creek	1849		
Reported Shipwreck	Harriet and Martha	Dry Tortugas	1854		
Reported Shipwreck	Harry B. Ritter	Southwest Reef, Tortugas	1895		
Reported Shipwreck	Havana	Florida Coast	1934		
Reported Shipwreck	Hebrus	Pickles Reef	1838		
Reported Shipwreck	Hector	Florida Keys	1800		
Reported Shipwreck	Helen E. Booker	Elbow Reef/Carysfort Reef	1857		
Reported Shipwreck	Henrietta Marie	New Ground Reef north of the Marquesas Keys	1700	MO00130	No
Reported Shipwreck	Henry	Florida Reef/Key West	1831		

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Reported Shipwreck	Henry	Marquesas Keys	1848		
Reported Shipwreck	Henry J. May	Southwest Reef in Dry Tortugas	1877		
Reported Shipwreck	Henry Meaner	Far out to sea West of the Dry Tortugas	1878		
Reported Shipwreck	Henry R. Tilton	Florida Straits	1878		
Reported Shipwreck	Herald	Ledbury Reef	1842		
Reported Shipwreck	Herbert May	Marquesas Reef	1922		
Reported Shipwreck	Hermanos	Carysfort Reef	1872		
Reported Shipwreck	Highlander	Carysfort Reef	1812		
Reported Shipwreck	Hilton	Carysfort Light	1937		
Reported Shipwreck	Holmes	East Key, Tortugas	1859		
Reported Shipwreck	Honduras	Key West	1870		
Reported Shipwreck	Hope	Alligator Reef	1848		
Reported Shipwreck	Hope for Peace	Carysfort Reef	1821		
Reported Shipwreck	Hope of London	Pickles Reef	1878		
Reported Shipwreck	Horace	Pickles Reef or French Reef about 15 miles southward of Carysfort Light	1860		
Reported Shipwreck	Howlett	Cape Florida	1744		
Reported Shipwreck	Hudson	Little Sand Key	1848		
Reported Shipwreck	Hugh de Payens	Abandoned off the Tortugas, she was later seen drifting upside down in the Florida Channel between Sal Key and Key West	1919		
Reported Shipwreck	Hurricane	Key West	1846		
Reported Shipwreck	Hyder Alley	Marquesas Key Shoals	1838		
Reported Shipwreck	Iconium	Looe Key	1854		
Reported Shipwreck	Ida C. Southard	Approximately 20 miles bearing West off Sombrero Light	1894		
Reported Shipwreck	Impulse	Key West	1909		

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Reported Shipwreck	Indian Hunter	French Reef/Pickles Reef	1859		
Reported Shipwreck	Industry	Cape Florida Light	1837		
Reported Shipwreck	Ingrid	Fowey Rocks	1895		
Reported Shipwreck	Iowa	Caesar's Creek	1849		
Reported Shipwreck	Irene	Dry Tortugas	1907		
Reported Shipwreck	Iris	Florida Reef	1846		
Reported Shipwreck	Isaac Allerton	Key West	1856		
Reported Shipwreck	Isabella	Alligator Reef	1835		
Reported Shipwreck	Isabella	French Reef	1875		
Reported Shipwreck	Isabella	Bahia Honda Key	1855		
Reported Shipwreck	Isabella Reed	Conch Reef	1850		
Reported Shipwreck	Ishuria	Mosquito Bank	1896		
Reported Shipwreck	Island Belle	Key West	1926		
Reported Shipwreck	Island Home	Near Sand Key Light (one source says Marquesas Key)	1882		
Reported Shipwreck	J. Brickmore	Carysfort Light	1865		
Reported Shipwreck	J. Frank Seavey	Florida Straits	1920		
Reported Shipwreck	J. I. W. Coffin	Grecian Shoal	1853		
Reported Shipwreck	J. W. Roland/Rowland	Pickles Reef	1860		
Reported Shipwreck	Jalapo	5 miles East of Marquesas	1876		
Reported Shipwreck	James	Florida Coast	1836		
Reported Shipwreck	James Smith	Carysfort Reef	1850		
Reported Shipwreck	James W. Lawrence	Middle Sandbornes	1865		
Reported Shipwreck	Jane H. Crawford	Conch Reef	1878		
Reported Shipwreck	Jane M. Herward	Cape Florida	1865		
Reported Shipwreck	Jean Key	East end of reef	1835		

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Reported Shipwreck	Jerusalem	Florida Keys Reef	1815		
Reported Shipwreck	Jesus y Nuestra Senora Del Rosario	Florida Reefs	1622		
Reported Shipwreck	Jeune France/June France	Pickles Reef	1853		
Reported Shipwreck	JNV (?) Parker	Carysfort Reef	1846		
Reported Shipwreck	Johan Carl/Carl John	Florida Keys	1825		
Reported Shipwreck	John Britton	Key Tavernier	1835		
Reported Shipwreck	John C. Calhoun	Caesar's Creek	1842		
Reported Shipwreck	John Crockford	Dry Rocks	1866		
Reported Shipwreck	John Henry Sherman	Garden Key, Dry Tortugas, maybe not a loss	1928		
Reported Shipwreck	John Howell	Dry Tortugas	1847		
Reported Shipwreck	Joseph Baker	North Key Flats, 5 miles E of Ft. Jefferson, Dry Tortugas	1891		
Reported Shipwreck	Joseph Meigs	Cape Florida Reef	1863		
Reported Shipwreck	Josephine	Carysfort Reef	1850		
Reported Shipwreck	Joseph A. Davis	Grecian Shoals	1866		
Reported Shipwreck	Joshua H Marvell	Dry Tortugas	1887		
Reported Shipwreck	Julia	Carysfort Reef	1838		
Reported Shipwreck	Juniata	North Cape Florida	1871		
Reported Shipwreck	Juno	Crocker Reef	1848		
Reported Shipwreck	Juno	Carysfort Reef	1812		
Reported Shipwreck	Kate	Elbow Reef	1892		
Reported Shipwreck	Kelvin	Pickles Reef	1857		
Reported Shipwreck	Key West	Key West	1846		
Reported Shipwreck	Key West	Key West Harbor	1870		
Reported Shipwreck	Kingston	Off Key Largo	1752		
Reported Shipwreck	Kistrel (Kestrel?)	Carysfort Reef	1848		

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Reported Shipwreck	L. Mc Neill	Mosquito Inlet	1916		
Reported Shipwreck	L. W. Maxwell	Eastern Dry Rocks	1854		
Reported Shipwreck	La Bruce	Pickles Reef	1837		
Reported Shipwreck	La Reunion	Probably in Lower Florida Keys	1846		
Reported Shipwreck	Lady Franklin	French Reef	1862		
Reported Shipwreck	Lafayette	Key West	1846		
Reported Shipwreck	Lake City	Key West	1918		
Reported Shipwreck	Lalia	Southwest Reef, Tortugas	1883		
Reported Shipwreck	Lancaster	Florida Keys	1752		
Reported Shipwreck	Langgarten	Alligator Reef	1858		
Reported Shipwreck	Las Mulas	Man Key	1860		
Reported Shipwreck	Laura	Carysfort Reef	1842		
Reported Shipwreck	Laura	Carysfort Reef	1835		
Reported Shipwreck	Laura Russ	Alligator Reef	1860		
Reported Shipwreck	Lavinia Adams	Looe Key	1855		
Reported Shipwreck	Lawrence	Conch Reef	1843		
Reported Shipwreck	Ledbury	Cape Florida	1769		
Reported Shipwreck	Ledieque	Cayo de Tavanos	1733		
Reported Shipwreck	Lee	Off the Tortugas	1874		
Reported Shipwreck	Legium	Caesar's Creek	1859		
Reported Shipwreck	Leo	Tortugas	1831		
Reported Shipwreck	Leone	At Key West while entering Port	1872		
Reported Shipwreck	Leopard	Florida Keys	1823		
Reported Shipwreck	Leopold O'Donnell	Caesar's Creek	1849		
Reported Shipwreck	Letherbe/Let Her Be	Caesar's Creek	1867		

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Reported Shipwreck	Levinia Adams	Looe Key	1855		
Reported Shipwreck	Lewis H. Goward	Key West	1921		
Reported Shipwreck	Lewis J. Stocker	Key West	1878		
Reported Shipwreck	Lexington	Pickles Reef	1835		
Reported Shipwreck	Liberty	Elbow Reef	1874		
Reported Shipwreck	Lily White	30 miles Northwest of Key West	1897		
Reported Shipwreck	Linden	Mary Maria Reef, Carysfort Reef	1854		
Reported Shipwreck	Linedora	Carysfort Reef	1846		
Reported Shipwreck	Lion/Lyon	On Pickles Reef	1835		
Reported Shipwreck	Lively	Florida Keys	1791		
Reported Shipwreck	Lively	Florida Keys	1819		
Reported Shipwreck	Lizzie Sturgis		1858		
Reported Shipwreck	London	Rebecca Shoal	1892		
Reported Shipwreck	Lone Star	North Dry Rocks	1891		
Reported Shipwreck	Lora	Florida Keys	1798		
Reported Shipwreck	Louis H.	Sombrero Key Light	1919		
Reported Shipwreck	Louisiana	South point of Carysfort Reef	1836		
Reported Shipwreck	Louisiana	Off Sombrero Reef	1910		
Reported Shipwreck	Lovely Ann	Florida Keys	1792		
Reported Shipwreck	Lucy	Looe Key	1853		
Reported Shipwreck	Lucy M	50 miles Northwest of Key West	1881		
Reported Shipwreck	Luisa A	Loggerhead Key	1882		
Reported Shipwreck	Mabel	Pulaski Shoals Flat Reef, Tortugas	1891		
Reported Shipwreck	Magdala	Alligator Reef	1848		
Reported Shipwreck	Magdalen	Florida Keys	1816		

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Reported Shipwreck	Magnet	Conch Reef	1843		
Reported Shipwreck	Magnolia	Looe Key	1855		
Reported Shipwreck	Magnolia	Key West	1910		
Reported Shipwreck	Majestic	Carysfort Reef	1835		
Reported Shipwreck	Majestic	Key West	1943		
Reported Shipwreck	Malcom	French Reef	1858		
Reported Shipwreck	Managua	28 Nautical Miles SSE of Key West	1942		
Reported Shipwreck	Manatee	Key West	1907		
Reported Shipwreck	Manchester	Florida Reef	1841		
Reported Shipwreck	Mandarin	Alligator Reef	1846		
Reported Shipwreck	Mandarin	Elbow Reef	1848		
Reported Shipwreck	Mangibello	Alligator Reef	1904		
Reported Shipwreck	Manlius	Elbow Reef	1976		
Reported Shipwreck	Manzanillo	12 NM South Southwest of Key West	1942		
Reported Shipwreck	Marcella	Cape Florida Light	1831		
Reported Shipwreck	Marcia Reynolds	20 miles Northwest by West of Sombrero Light	1884		
Reported Shipwreck	Margaret Kerr	Crocker Reef	1865		
Reported Shipwreck	Margaretta	French Reef	1868		
Reported Shipwreck	Maria	Carysfort Reef	1831		
Reported Shipwreck	Maria	Off Boot Key	1944		
Reported Shipwreck	Maria	Dry Tortugas	1806		
Reported Shipwreck	Maria	Carysfort Reef	1831		
Reported Shipwreck	Maria	Carysfort Reef	1835		
Reported Shipwreck	Maria Ferguson	Tortugas	1871		
Reported Shipwreck	Mariner	Pickles/French Reef	1856		

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Reported Shipwreck	Mariposa	Off Florida coast	1870		
Reported Shipwreck	Marquis De Pombal	Florida Keys	1817		
Reported Shipwreck	Mars	Dry Rocks	1851		
Reported Shipwreck	Martha Brae	Cape Florida	1816		
Reported Shipwreck	Martha Gilchrist	Dry Tortugas	1858		
Reported Shipwreck	Martha Post	Conch Reef	1854		
Reported Shipwreck	Martha Regan	Marquesas Shoal	1859		
Reported Shipwreck	Mary	Cape Florida	1778		
Reported Shipwreck	Mary	Looe Key	1855		
Reported Shipwreck	Mary	Pickles Reef	1868		
Reported Shipwreck	Mary	Key Tavernier Creek	1836		
Reported Shipwreck	Mary & Priscilla	Off Key Largo	1752		
Reported Shipwreck	Mary Ann	Florida Keys	1835		
Reported Shipwreck	Mary Averill	Carysfort Reef	1844		
Reported Shipwreck	Mary Dale	Alligator Reef	1855		
Reported Shipwreck	Mary E. Riggs	Inshore French Reef	1879		
Reported Shipwreck	Mary Eliza	Dry Tortugas	1911		
Reported Shipwreck	Mary Hale	Alligator Reef	1855		
Reported Shipwreck	Mary Hart	Mosquito Shoal	1831		
Reported Shipwreck	Mary Howland	Delta Shoal	1839		
Reported Shipwreck	Mary London	Looe Key	1855		
Reported Shipwreck	Mary Maria	Pickles Reef	1837		
Reported Shipwreck	Maryland	Washerwoman Shoal	1849		
Reported Shipwreck	Matawa	Near Key West	1872		
Reported Shipwreck	Mathilda	Quicksands	1897		

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Reported Shipwreck	Matthew Van Bree	Yucatan Reef, a small reef near the Western end Alligator Reef	1852		
Reported Shipwreck	May	Florida Keys	1752		
Reported Shipwreck	Mayflower	Carysfort Reef	1858		
Reported Shipwreck	Mechanic	Triumph Reef	1851		
Reported Shipwreck	Medford	Blown five miles from Key West toward Sand Key	1909		
Reported Shipwreck	Meggie	Southwest Point of Loggerhead Reef	1877		
Reported Shipwreck	Melemora	Key West	1846		
Reported Shipwreck	Memphis	Conch Reef	1877		
Reported Shipwreck	Merchant	Pacific Reef/Carysfort Reef	1851		
Reported Shipwreck	Merchant	Carysfort Reef	1808		
Reported Shipwreck	Merrie (Merri) England	French Reef/Pickles Reef	1877		
Reported Shipwreck	Merrimack	Florida Keys	1817		
Reported Shipwreck	Merrimack	Elbow Reef	1867		
Reported Shipwreck	Meteor	On Pickles Reef	1854		
Reported Shipwreck	Mexico	Shoals of the Tortugas	1891		
Reported Shipwreck	Mezzie	Dry Tortugas	1877		
Reported Shipwreck	Miami	on Pickles Reef	1859		
Reported Shipwreck	Middlesex	2 miles northward of light, Key Rodriguez	1858		
Reported Shipwreck	Mill	Cape Florida	1774		
Reported Shipwreck	Milton	Carysfort Reef	1858		
Reported Shipwreck	Minerva	Near Carysfort Reef Lightship	1847		
Reported Shipwreck	MINI	Pickles Reef	1859		
Reported Shipwreck	Mini (Mimi)	on Pickles Reef	1859		
Reported Shipwreck	Minnehaha	Little Conch Reef	1868		
Reported Shipwreck	Miss Sandra	Outside jetty of Northwest Channel Key West			

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Reported Shipwreck	Mississippi	Looe Key	1841		
Reported Shipwreck	Mississippi	Basin Hill Banks	1874		
Reported Shipwreck	Mississippi	Looe Key	1829		
Reported Shipwreck	Modeste	Off Key Largo	1819		
Reported Shipwreck	Mollie Emma	30 Miles East of Key West	1876		
Reported Shipwreck	Monroe County	At Key West	1928		
Reported Shipwreck	Montague	Cape Florida	1774		
Reported Shipwreck	Moonlight	Mosquito Shoals (5 miles west of Elbow Reef)	1870		
Reported Shipwreck	Moonstone	Near Carysfort Reef	1894		
Reported Shipwreck	Morris, USRC	NW Shoal, 3 miles from Key West	1846		
Reported Shipwreck	Mortoun	Near Vaca Key	1848		
Reported Shipwreck	Moslem	Looe Key	1846		
Reported Shipwreck	Moulton	Pickles Reef	1848		
Reported Shipwreck	Mount Pleasant	Plantation Key	1905		
Reported Shipwreck	Mount Vernon	Carysfort Reef	1844		
Reported Shipwreck	Mountain Home	North of Key West	1875		
Reported Shipwreck	Mt. Hope	Key West	1831		
Reported Shipwreck	Mulhouse	Quicksands near the Tortugas	1859		
Reported Shipwreck	Muller	Sugarloaf Reef	1869		
Reported Shipwreck	Mutter Schultz	American Shoal	1870		
Reported Shipwreck	Muzzie (sp?)	Florida Reef	1877		
Reported Shipwreck	N. Kimball	Dry Rocks	1853		
Reported Shipwreck	N.M. Terry	Eastern French Reef	1864		
Reported Shipwreck	Nacoochee	French Reef	1852		
Reported Shipwreck	Nacoochee	Carysfort Reef	1855		

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Reported Shipwreck	Nada	Inside of Tennessee Reef off Long Key	1894		
Reported Shipwreck	Naffaw	Florida Keys	1741		
Reported Shipwreck	Nanna	Carysfort Reef	1828		
Reported Shipwreck	Nannu	Key West	1828		
Reported Shipwreck	Nantaise	Conch Reef	1837		
Reported Shipwreck	Nao San Anton	Florida Keys	1521		
Reported Shipwreck	Napoleon	Key West	1846		
Reported Shipwreck	Narragansett	Alligator Reef	1867		
Reported Shipwreck	Natchez	Westerly point of Carysfort Reef, Pickles Reef	1836		
Reported Shipwreck	Nathaniel Kimball	Eastern Dry Rocks	1853		
Reported Shipwreck	Navigator	Key West	1846		
Reported Shipwreck	Nellie M. Slade	Dry Tortugas	1900		
Reported Shipwreck	Nelson	French Reef	1846		
Reported Shipwreck	Nepenthe	Tavernier Key	1932		
Reported Shipwreck	New Orleans	Dry Tortugas	1850		
Reported Shipwreck	New York	Dry Tortugas	1842		
Reported Shipwreck	Newark	Carysfort Reef, On Pickles Reef	1845		
Reported Shipwreck	Ney	Pickles Reef	1859		
Reported Shipwreck	Nicarao	Off Florida Keys	1942		
Reported Shipwreck	Noah's Ark	Florida Keys	1795		
Reported Shipwreck	Noble Bounty	Cape Florida	1787		
Reported Shipwreck	Nonanritum (sp?)	Florida Reef	1870		
Reported Shipwreck	Nor Wester	Key West Harbor	1938		
Reported Shipwreck	Nordkyn	Coffins Patch (one source says Vacas Key)	1875		
Reported Shipwreck	Norman	Conch Reef	1836		

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Reported Shipwreck	Norman H. Davis	Key West	1942		
Reported Shipwreck	Northampton	outer side of reef heading NE, Molasses Reef	1883		
Reported Shipwreck	Northman	Looe Key	1858		
Reported Shipwreck	Nor'Wester	Key West	1872		
Reported Shipwreck	Nuestra Senora de Concepcion Y San Josefe	Key Largo	1689		
Reported Shipwreck	Nuestra Senora de Conception y San Jose	Key Largo	1689		
Reported Shipwreck	Nuestra Senora del Garcia	Rodriguez Key	1830		
Reported Shipwreck	Nuestra Senora del Rosario	Matacumbe Key	1622		
Reported Shipwreck	Ocean Queen	Florida Reef	1877		
Reported Shipwreck	Ocean Star	Brewster Reef	1860		
Reported Shipwreck	Oconee	Stirrup Key	1845		
Reported Shipwreck	Octavia	Tavernier Key	1856		
Reported Shipwreck	Old Chad	Lower Matacumbe	1872		
Reported Shipwreck	Old River	Matacumbe Key	1947		
Reported Shipwreck	Olive & Eliza	Key West	1846		
Reported Shipwreck	Olive Branch	Carysfort Reef	1835		
Reported Shipwreck	Omaha	Presumed to be in Lower Florida Keys	1869		
Reported Shipwreck	Opelousas	Little Pickles Reef	1843		
Reported Shipwreck	Oracle	Conch Reef	1867		
Reported Shipwreck	Orion	Florida Keys	1812		
Reported Shipwreck	Orion	Sand Key	1839		
Reported Shipwreck	Orleans	Carysfort Reef	1826		
Reported Shipwreck	Ortolan	Off Cape Florida	1878		
Reported Shipwreck	Osiris	Miami	1921		
Reported Shipwreck	Osmond	Dry Tortugas, Southwest Key	1898		

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Reported Shipwreck	Ostean	Navy Harbor, Key West	1858		
Reported Shipwreck	Ostervald	Far out to sea off Florida Bay area in Gulf of Mexico	1858		
Reported Shipwreck	Othello	Collins Patch (likely Coffins Patch)	1832		
Reported Shipwreck	Overman	Crocker Reef	1853		
Reported Shipwreck	Oxford	On Pickles Reef, Carysfort Light bearing northeast by north	1894		
Reported Shipwreck	Packet Ship	Sandy Key	1841		
Reported Shipwreck	Packet Ship	Key West	1842		
Reported Shipwreck	Padua	near Tavernier Key			
Reported Shipwreck	Padua Highlander	Carysfort Reef	1812		
Reported Shipwreck	Pan-Massachusetts	Off Florida Coast	1942		
Reported Shipwreck	Pargo	Cape Sable	1905		
Reported Shipwreck	Parthenon	Conch Reef	1860		
Reported Shipwreck	Patriarca San Jose	Pickles Reef	1870		
Reported Shipwreck	Pauline	On Pickles Reef	1854		
Reported Shipwreck	Pee Dee	American Shoals	1854		
Reported Shipwreck	Peerless	Near Boot Key, Marathon Area	1909		
Reported Shipwreck	Pelton				
Reported Shipwreck	Pendelton Brothers	Dry Tortugas	1913		
Reported Shipwreck	Pequot	Washerwoman Shoal	1842		
Reported Shipwreck	Perit	Pickles Reef	1867		
Reported Shipwreck	Persia	Looe Key	1842		
Reported Shipwreck	Petrie	Washerwoman Shoal	1888		
Reported Shipwreck	Philadelphia	Western part of reef	1835		
Reported Shipwreck	PHILLIS	Florida Keys	1752		
Reported Shipwreck	Phineas W. Sprague	Little Conch Reef	1902		

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Reported Shipwreck	Phoenix	Key Vaca	1857		
Reported Shipwreck	Pilgrim	Dry Tortugas	1843		
Reported Shipwreck	Pilita	Carysfort Reef/Soldier Key	1851		
Reported Shipwreck	Piute	Mosquito Inlet	1927		
Reported Shipwreck	Pizarro	Carysfort Reef	1835		
Reported Shipwreck	Planter		1921		
Reported Shipwreck	Platina/Platinia	Carysfort Reef	1846		
Reported Shipwreck	Poacher	South of Dry Tortugas	1840		
Reported Shipwreck	Pointe-A-Petre	Carysfort Reef	1825		
Reported Shipwreck	Prarie Bird	Key West Harbor	1875		
Reported Shipwreck	Prarie Rose	Marquesas Keys	1876		
Reported Shipwreck	Prentiss Hobbs	Elbow Reef	1865		
Reported Shipwreck	President	Pickles Reef	1829		
Reported Shipwreck	Primera De Rosaria	Carysfort Reef	1834		
Reported Shipwreck	Prince Umberto	Duck Key	1888		
Reported Shipwreck	Princeton	Carysfort Reef	1849		
Reported Shipwreck	Priscilla L. Ray	Key West	1920		
Reported Shipwreck	Providence	Florida Keys	1805		
Reported Shipwreck	Providencia	Cape Florida area, Florida Reef	1878		
Reported Shipwreck	Pulaski	On the Tortugas (possible that Pulaski Shoal was named after this vessel)	1832		
Reported Shipwreck	Quebec	Florida Keys	1818		
Reported Shipwreck	Quebec	Carysfort Reef	1848		
Reported Shipwreck	Queen Anne	Florida Keys	1752		
Reported Shipwreck	Queen Mob	Conch Reef	1865		
Reported Shipwreck	Quicksands Wreck	West of Marquesas Keys		MO00141	No

Reported Shipwreck	Quoque	Elbow Reef	1920		
Reported Shipwreck	R. E. Lee	On a shoal (presumed to be in Lower Florida Keys)	1877		
Reported Shipwreck	R. M. Charlton	Carysfort Reef	1854		
Reported Shipwreck	R-12	Off Key West	1943		
Reported Shipwreck	RACE	At Knights Key	1906		
Reported Shipwreck	Railroad Site	Nikes Channel			
Reported Shipwreck	Rainbow	Thomas Harbor Key	1855		
Reported Shipwreck	Ranger	Carysfort Reef	1850		
Reported Shipwreck	Rask	Quicksands	1886		
Reported Shipwreck	Rattler	Carysfort Reef, Key Largo	1805		
Reported Shipwreck	Rebecca Barton	Key West	1866		
Reported Shipwreck	Refuse Site	Spanish Harbor Bridge	1906		
Reported Shipwreck	Register	Carysfort Reef	1843		
Reported Shipwreck	Republic	Carysfort Reef	1854		
Reported Shipwreck	Restless	Lower Florida Keys	1872		
Reported Shipwreck	Restless, USS	Off Cape Sable	1864		
Reported Shipwreck	Revenge	Key West	1825		
Reported Shipwreck	Revonoc	Hawk Channel	1958		
Reported Shipwreck	Rhee Galley	Florida Keys	1744		
Reported Shipwreck	Rhode Island	Florida Keys	1752		
Reported Shipwreck	Rienzi	Section of Carysfort known as Pickles Reef, later referenced as Rienzi Reef	1845		
Reported Shipwreck	Rienzi/Reznic	Pickles Reef	1845		
Reported Shipwreck	Ringgold	Northwest Channel, Key West	1865		
Reported Shipwreck	River Smith/Riversmith	6 miles northward of lighthouse, Carysfort Reef	1858		
Reported Shipwreck	Riverside	Quicksands, East by Northeast of Rebecca Shoal Light	1896		

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Reported Shipwreck	Robert	Key West	1918		
Reported Shipwreck	Robert Boak	French Reef	1867		
Reported Shipwreck	Robert M. Charlton	French Reef	1854		
Reported Shipwreck	Robert Morris	Pelican Shoal	1853		
Reported Shipwreck	Robin Hood		1924		
Reported Shipwreck	Rohoboth	Carysfort Reef	1829		
Reported Shipwreck	Romina	11-12 miles from Carysfort Light	1895		
Reported Shipwreck	Rosalie	Carysfort Reef	1847		
Reported Shipwreck	Rosalina	On Pickles Reef	1837		
Reported Shipwreck	ROSALINA	Pickles Reef	1837		
Reported Shipwreck	Rose Murphy	Sand Key Light	1927		
Reported Shipwreck	Rosemary	Key West	1930		
Reported Shipwreck	Roseneath	Loo Key	1857		
Reported Shipwreck	Roseway	Newfound Harbor	1847		
Reported Shipwreck	Rudolph Groning	Southwest Reef, Tortugas	1843		
Reported Shipwreck	Rugged	50 Miles Southeast of Miami	1943		
Reported Shipwreck	Russel		1846		
Reported Shipwreck	S. O. CO. No. 90	Dry Tortugas	1906		
Reported Shipwreck	S.R. Mallory	Key West	1909		
Reported Shipwreck	Sabine	Carysfort Reef	1856		
Reported Shipwreck	Sadino	Pulaski Shoal on the Southwest Reef, Tortugas	1888		
Reported Shipwreck	Saint Harlampy	Carysfort Reef	1843		
Reported Shipwreck	Sally	Florida Reef	1818		
Reported Shipwreck	Samuel H. Crawford	Near Pickles reef	1877		
Reported Shipwreck	Samuel Lawrence	Grecian Shoal	1860		

Reported Shipwreck	Samuel Roberts		1847		
Reported Shipwreck	San Anton	Florida Keys	1521		
Reported Shipwreck	San Antonio	On reef near Key West	1768		
Reported Shipwreck	San Ignacio	Cayo De Bocas	1733		
Reported Shipwreck	San Juan	Near San Vincent off North end of Key Largo	1689		
Reported Shipwreck	San Vincent Ferrer	1/2 mile off North end of Key Largo	1689		
Reported Shipwreck	Sandwich	Florida Keys	1819		
Reported Shipwreck	Santa Anna Maria	Key Largo	1665		
Reported Shipwreck	Santa Christina	25 miles off Key West	1919		
Reported Shipwreck	Santa Rosa	Reported due South of Key West			
Reported Shipwreck	Santiago De Cuba	12.8 Nautical Miles South of Key West	1942		
Reported Shipwreck	Santisima Trinidad	Florida Keys	1623		
Reported Shipwreck	Sarah Ann	Sombrero Reef	1837		
Reported Shipwreck	Saturn	Offshore	1896		
Reported Shipwreck	Saxony	Cape Florida	1854		
Reported Shipwreck	Scandinavia	Conch Reef	1867		
Reported Shipwreck	Scotchman	Rienzi Reef	1853		
Reported Shipwreck	Scotia		1896		
Reported Shipwreck	Scotsman	Rienzi Reef	1853		
Reported Shipwreck	Sea Drift	Struck Carysfort Reef and was swept upon Key Largo	1835		
Reported Shipwreck	Sea Flower	Southwest Tortugas	1834		
Reported Shipwreck	Sea Lark	At Spanish Harbor	1865		
Reported Shipwreck	Sea Ranger	Tavernier	1858		
Reported Shipwreck	Sebra Crooker	Looe Key	1854		
Reported Shipwreck	Sebulon	Dry Tortugas on Southwest Reef	1887		

Reported Shipwreck	Select	Dry Tortugas, Tortugas Shoal	1844		
Reported Shipwreck	Senora	Bird Key	1872		
Reported Shipwreck	Serafina	Key West	1926		
Reported Shipwreck	Shannon	Dry Tortugas	1892		
Reported Shipwreck	Shelter Island	Loggerhead Reef Newfound Harbor Keys	1896		
Reported Shipwreck	Siddons		1856		
Reported Shipwreck	Sierra Nevada		1858		
Reported Shipwreck	Silas Holmes		1857		
Reported Shipwreck	Sir James Ross		1858		
Reported Shipwreck	Sir John Sherbroke	Dry Tortugas	1816		
Reported Shipwreck	Sir Walter Raleigh	Pacific Reef	1861		
Reported Shipwreck	Sirius		1843		
Reported Shipwreck	Slobodna	Molasses Reef	1887		
Reported Shipwreck	Snow Drop		1854		
Reported Shipwreck	Solway	Florida Keys	1818		
Reported Shipwreck	Sonora	Dry Tortugas	1872		
Reported Shipwreck	Sophia/Sophie		1869		
Reported Shipwreck	South American	French Reef	1900		
Reported Shipwreck	Spanish Vessels	Los Martires (Key Largo Area)	1549		
Reported Shipwreck	Spar	Key Largo	1872		
Reported Shipwreck	Sparkling Sea		1863		
Reported Shipwreck	Sparkling Water	Northwest of Tortugas	1875		
Reported Shipwreck	Speedwell	Carysfort Reef off Key Largo	1796		
Reported Shipwreck	Speedwell	Off the Marquesas, 18 miles from Key West	1899		
Reported Shipwreck	Spindrift	6.3 Nautical Miles North of Key West	1944		

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Reported Shipwreck	Splendid	Marquesas Key	1832		
Reported Shipwreck	St. Cloud	Florida Reef	1848		
Reported Shipwreck	St. Francisco		0		
Reported Shipwreck	St. James	Conch Key	1871		
Reported Shipwreck	St. Mark	Carysfort Reef	1846		
Reported Shipwreck	St. Mary's	Sambos	1847		
Reported Shipwreck	Star	Either Conch Key or Conch Reef	1870		
Reported Shipwreck	Starr		1858		
Reported Shipwreck	Staters	Dry Rocks	1844		
Reported Shipwreck	Sterling	On Conch Reef	1854		
Reported Shipwreck	Stillman F. Kelley	Salt Key Bank	1909		
Reported Shipwreck	Stranger	Western Dry Rocks	1836		
Reported Shipwreck	Sturtevant, USS	7 Miles North of Key West	1942		
Reported Shipwreck	Styria		1901		
Reported Shipwreck	Sultan		1858		
Reported Shipwreck	Sunshine	Near Cross Key (connecting Florida Keys with Mainland)	1949		
Reported Shipwreck	Sverige/Suerige	on Pickles Reef	1877		
Reported Shipwreck	Sweetheart	Off Long Key	1904		
Reported Shipwreck	Swift	Off Key Largo	1824		
Reported Shipwreck	Sylph	Sambo	1904		
Reported Shipwreck	Sylphide	Dry Tortugas	1850		
Reported Shipwreck	Sylva		1943		
Reported Shipwreck	Taglioni	Carysfort Light Ship	1848		
Reported Shipwreck	Tallahassee	Dry Tortugas	1836		
Reported Shipwreck	Tartar	East Key Reef, Dry Tortugas	1855		

Reported Shipwreck	Tchernia/Tchernayia		1859		
Reported Shipwreck	Telumah	Biscayne Reef	1845		
Reported Shipwreck	Tenasserim		1891		
Reported Shipwreck	Tennessee	Long Key	1832		
Reported Shipwreck	Tevere		1855		
Reported Shipwreck	Tevonia	Carysfort Reef	1845		
Reported Shipwreck	Texas	Tavanies	1844		
Reported Shipwreck	Thames		1867		
Reported Shipwreck	Thendara	Key West	1926		
Reported Shipwreck	Theodore		1835		
Reported Shipwreck	Theodore	Florida Keys	1824		
Reported Shipwreck	Theophilus	Alligator Reef	1836		
Reported Shipwreck	Thomas	Florida Reef	1835		
Reported Shipwreck	Thomas Clooner	Bay Point, in Sugarloaf Sound	1927		
Reported Shipwreck	Thomas P. Barklow	Florida Bay	1874		
Reported Shipwreck	Thomas R. Pillsbury	Off the Tortugas	1878		
Reported Shipwreck	Thornley	Pickles Reef	1898		
Reported Shipwreck	Three Sisters	Carysfort Reef	1816		
Reported Shipwreck	Tiger	Eastern Sandbornes	1860		
Reported Shipwreck	Tilamon	Delta Shoals	1852		
Reported Shipwreck	Toisin/Toison	Key West	1831		
Reported Shipwreck	Tolomeo	Dry Tortugas	1881		
Reported Shipwreck	Tomas de Resa	Turtle Reef	1870		
Reported Shipwreck	Tovano (?Il Tovano)	Alligator Reef	1855		
Reported Shipwreck	Trinidad	Ragged Key	1870		

Reported Shipwreck	Trinity	Pickles Reef	1857		
Reported Shipwreck	Triton	Key West Harbor	1909		
Reported Shipwreck	Triumph	Off Caesar's Creek	1838		
Reported Shipwreck	True Briton	Rebecca Shoal at the Quicksands	1889		
Reported Shipwreck	Tuscan	Great Conch Reef	1846		
Reported Shipwreck	Two Sisters	Grecian Rocks	1838		
Reported Shipwreck	Tyger, HMS	Dry Tortugas	1742		
Reported Shipwreck	U-157	Off Key West	1942		
Reported Shipwreck	Unidentified American Brig	South West side of Carysfort Reef	1824		
Reported Shipwreck	Unidentified Barge		1949		
Reported Shipwreck	Unidentified Bark	Carysfort Reef	1837		
Reported Shipwreck	Unidentified Bark	Carysfort Reef	1841		
Reported Shipwreck	Unidentified Bark	Pickles Reef	1856		
Reported Shipwreck	Unidentified Brig	Florida Keys	1819		
Reported Shipwreck	Unidentified Brig	Carysfort Reef	1822		
Reported Shipwreck	Unidentified Brig	Carysfort Reef	1822		
Reported Shipwreck	Unidentified Brig	Florida Keys	1824		
Reported Shipwreck	Unidentified Brig	Carysfort Reef	1834		
Reported Shipwreck	Unidentified Brig	15 miles W of Carysfort Reef	1840		
Reported Shipwreck	Unidentified Brig	Carysfort Reef	1840		
Reported Shipwreck	Unidentified Brig	Matacumbe Key	1843		
Reported Shipwreck	Unidentified Brig	Carysfort Reef	1843		
Reported Shipwreck	Unidentified Brig	Carysfort Reef	1850		
Reported Shipwreck	Unidentified Brig	Carysfort Reef	1854		
Reported Shipwreck	Unidentified Brig	Conch Reef	1856		

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Reported Shipwreck	Unidentified British Brig	Florida Keys	1824		
Reported Shipwreck	Unidentified British Frigate	NW of Whistle buoy 2	1811		
Reported Shipwreck	Unidentified English Ship	Florida Keys	1782		
Reported Shipwreck	Unidentified Five Spanish Galleons	Lower Matecumbe Key	1622		
Reported Shipwreck	Unidentified Galleon	Cape Florida Lighthouse	0		
Reported Shipwreck	Unidentified Galleon	Conch Reef			
Reported Shipwreck	Unidentified Galleon	Florida Keys	1630		
Reported Shipwreck	Unidentified Large ship	Florida Keys	1785		
Reported Shipwreck	Unidentified Large Ship	Carysfort Reef	1818		
Reported Shipwreck	Unidentified Large Vessel	Carysfort Reef	1819		
Reported Shipwreck	Unidentified Large Vessel	Florida Keys	1822		
Reported Shipwreck	Unidentified Nao	Florida Keys	1688		
Reported Shipwreck	Unidentified Schooner	Sandy Point, offshore point on Coco Plum Key	1800		
Reported Shipwreck	Unidentified Schooner	Carysfort Reef	1842		
Reported Shipwreck	Unidentified Ship	Florida Keys	1619		
Reported Shipwreck	Unidentified Ship	Carysfort Reef	1792		
Reported Shipwreck	Unidentified Ship	Carysfort Reef	1815		
Reported Shipwreck	Unidentified Ship	Carysfort Reef	1817		
Reported Shipwreck	Unidentified Ship	Carysfort Reef	1821		
Reported Shipwreck	Unidentified Ship	Carysfort Reef	1822		
Reported Shipwreck	Unidentified Ship	Caesar's Creek	1824		
Reported Shipwreck	Unidentified Ship	Carysfort Reef	1833		
Reported Shipwreck	Unidentified Ship	Florida Keys	1837		
Reported Shipwreck	Unidentified Ship	Carysfort Reef	1839		
Reported Shipwreck	Unidentified Ship	Carysfort Reef	1840		

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Reported Shipwreck	Unidentified Ship	Carysfort Reef	1841		
Reported Shipwreck	Unidentified Ship	Carysfort Reef	1842		
Reported Shipwreck	Unidentified Ship	Carysfort Reef	1843		
Reported Shipwreck	Unidentified Ship	Carysfort Reef	1844		
Reported Shipwreck	Unidentified Ship	Carysfort Reef	1851		
Reported Shipwreck	Unidentified Ship	Near Caesar's Creek, Carysfort Reef	1852		
Reported Shipwreck	Unidentified Ship	15 miles S of Carysfort Light	1852		
Reported Shipwreck	Unidentified Ship	20 miles W of Carysfort Reef	1853		
Reported Shipwreck	Unidentified Ship	Carysfort Reef	1854		
Reported Shipwreck	Unidentified Ships	Biscayne Bay Lighthouse			
Reported Shipwreck	Unidentified Spanish Galleon		1600		
Reported Shipwreck	Unidentified Two Spanish Galleions	North Key Largo	1689		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1577		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1792		
Reported Shipwreck	Unidentified Vessel	American Shoals			
Reported Shipwreck	Unidentified Vessel	Boca Chica			
Reported Shipwreck	Unidentified Vessel	Boca Chica			
Reported Shipwreck	Unidentified Vessel	Boca Chica			
Reported Shipwreck	Unidentified Vessel	Delta Shoals			
Reported Shipwreck	Unidentified Vessel	Delta Shoals			
Reported Shipwreck	Unidentified Vessel	Delta Shoals			
Reported Shipwreck	Unidentified Vessel	Delta Shoals			
Reported Shipwreck	Unidentified Vessel	Key West			
Reported Shipwreck	Unidentified Vessel	Key West			
Reported Shipwreck	Unidentified Vessel	Key West			

Reported Shipwreck	Unidentified Vessel	Key West			
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Reported Shipwreck	Unidentified Vessel	Key West			
Reported Shipwreck	Unidentified Vessel	Key West			
Reported Shipwreck	Unidentified Vessel	Key West			
Reported Shipwreck	Unidentified Vessel	Sambo Key			
Reported Shipwreck	Unidentified Vessel	Sambo Key			
Reported Shipwreck	Unidentified Vessel	Tavernier Key			
Reported Shipwreck	Unidentified Vessel	Tennessee Reef			
Reported Shipwreck	Unidentified Vessel	Key West	1866		
Reported Shipwreck	Unidentified Vessel	Key West	1881		
Reported Shipwreck	Unidentified Vessel	13 miles South of Sand Key			
Reported Shipwreck	Unidentified Vessel	Key West area			
Reported Shipwreck	Unidentified Vessel	Boca Chica Key area			
Reported Shipwreck	Unidentified Vessel	Key West area			
Reported Shipwreck	Unidentified Vessel	Bahia Honda			
Reported Shipwreck	Unidentified Vessel	Delta Shoal			
Reported Shipwreck	Unidentified Vessel	Looe Key (Loose Key?)			
Reported Shipwreck	Unidentified Vessel	Marathon end of 7 Mile Bridge			

Reported Shipwreck	Unidentified Vessel	Molasses Reef area			
Reported Shipwreck	Unidentified Vessel	Near Elbow Reef Tower			
Reported Shipwreck	Unidentified Vessel	Bamboo Banks, off Northwest End of Grassy Key on Gulf side			
Reported Shipwreck	Unidentified Vessel	North end of Carysfort Reef			
Reported Shipwreck	Unidentified Vessel	Key Largo area	1530		
Reported Shipwreck	Unidentified Vessel	Off Plantation Key	1533		
Reported Shipwreck	Unidentified Vessel	Off Upper Matecumbe Key	1550		
Reported Shipwreck	Unidentified Vessel	Off Vaca Key	1550		
Reported Shipwreck	Unidentified Vessel	Los Cayos De Los Martires (Key Largo Area)	1551		
Reported Shipwreck	Unidentified Vessel	Off Saddlebunch Keys	1554		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1577		
Reported Shipwreck	Unidentified Vessel	Wrecked at head of Los Martires (Elliot Key Or Key Largo)	1579		
Reported Shipwreck	Unidentified Vessel	Florida Keys, Monroe County	1590		
Reported Shipwreck	Unidentified Vessel	Alligator Reef	1595		
Reported Shipwreck	Unidentified Vessel	Off Alligator Reef	1595		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1619		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1619		
Reported Shipwreck	Unidentified Vessel	Keys, Monroe County	1619		
Reported Shipwreck	Unidentified Vessel	Dry Tortugas	1621		
Reported Shipwreck	Unidentified Vessel	Matacumbe Key	1622		
Reported Shipwreck	Unidentified Vessel	Off Marquesas Keys	1623		
Reported Shipwreck	Unidentified Vessel	Off Upper Matecumbe Key	1623		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1630		
Reported Shipwreck	Unidentified Vessel	Keys of Matecumbe	1634		

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Reported Shipwreck	Unidentified Vessel	Bamboo Banks, Florida Keys, Monroe County	1644		
Reported Shipwreck	Unidentified Vessel	Coral Reef at Dry Tortugas	1649		
Reported Shipwreck	Unidentified Vessel	3 miles off Crawl Key	1656		
Reported Shipwreck	Unidentified Vessel	Key West	1677		
Reported Shipwreck	Unidentified Vessel	Key West	1677		
Reported Shipwreck	Unidentified Vessel	Key West	1677		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1688		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1740		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1752		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1752		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1752		
Reported Shipwreck	Unidentified Vessel	Reefs off Key Largo	1767		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1768		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1768		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1768		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1769		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1770		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1770		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1771		
Reported Shipwreck	Unidentified Vessel	Matacumbe Key	1775		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1781		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1785		
Reported Shipwreck	Unidentified Vessel	Off Pigeon Key	1788		
Reported Shipwreck	Unidentified Vessel	Florida Reef	1790		
Reported Shipwreck	Unidentified Vessel	Florida Reef	1790		

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Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1792		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1792		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1792		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1792		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1792		
Reported Shipwreck	Unidentified Vessel	One Hour from Key Largo	1799		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1815		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1815		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1815		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1815		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1817		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1817		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1818		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1818		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1818		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1819		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1819		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1819		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1821		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1821		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1822		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1822		
Reported Shipwreck	Unidentified Vessel	Eastern Florida Keys	1822		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1822		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1822		

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Reported Shipwreck	Unidentified Vessel	Ledbury Reef	1822		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1824		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1824		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1824		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1824		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1824		
Reported Shipwreck	Unidentified Vessel	Southwest end of Carysfort Reef	1824		
Reported Shipwreck	Unidentified Vessel	Carysfort Reef	1829		
Reported Shipwreck	Unidentified Vessel	Looe Key	1830		
Reported Shipwreck	Unidentified Vessel	Dry Tortugas	1840		
Reported Shipwreck	Unidentified Vessel	Key West	1841		
Reported Shipwreck	Unidentified Vessel	Key West	1841		
Reported Shipwreck	Unidentified Vessel	Key West area	1841		
Reported Shipwreck	Unidentified Vessel	Key West	1842		
Reported Shipwreck	Unidentified Vessel	Key West	1844		
Reported Shipwreck	Unidentified Vessel	Key West	1844		
Reported Shipwreck	Unidentified Vessel	Key West	1846		
Reported Shipwreck	Unidentified Vessel	20 Miles west of Carysfort Reef	1853		
Reported Shipwreck	Unidentified Vessel	On Carysfort Reef	1854		
Reported Shipwreck	Unidentified Vessel		1855		
Reported Shipwreck	Unidentified Vessel	At Sand Key	1857		
Reported Shipwreck	Unidentified Vessel	At Stirrup Key	1857		
Reported Shipwreck	Unidentified Vessel	Key West	1866		
Reported Shipwreck	Unidentified Vessel	Key West	1866		
Reported Shipwreck	Unidentified Vessel	Key West	1870		

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Reported Shipwreck	Unidentified Vessel	Key West	1870		
Reported Shipwreck	Unidentified Vessel	Key West	1872		
Reported Shipwreck	Unidentified Vessel	Key West	1872		
Reported Shipwreck	Unidentified Vessel	Key West	1875		
Reported Shipwreck	Unidentified Vessel	Key West	1875		
Reported Shipwreck	Unidentified Vessel	Channel near Western Dry Rocks at entrance to Key West Harbor	1876		
Reported Shipwreck	Unidentified Vessel	Key West	1881		
Reported Shipwreck	Unidentified Vessel	Jetty at Northwest Entrance to Key West	1896		
Reported Shipwreck	Unidentified Vessel	Key West	1897		
Reported Shipwreck	Unidentified Vessel	Key West	1897		
Reported Shipwreck	Unidentified Vessel	By Northwest Passage Lighthouse	1903		
Reported Shipwreck	Unidentified Vessel	Marathon end of 7 Mile Bridge	1906		
Reported Shipwreck	Unidentified Vessel	Spanish Harbor Bridge	1906		
Reported Shipwreck	Unidentified Vessel	Key West	1909		
Reported Shipwreck	Unidentified Vessel	Key West	1909		
Reported Shipwreck	Unidentified Vessel	Key West	1909		
Reported Shipwreck	Unidentified Vessel	Boca Chica	1910		
Reported Shipwreck	Unidentified Vessel	Tennessee Reef	1913		
Reported Shipwreck	Unidentified Vessel		1919		
Reported Shipwreck	Unidentified Vessel	Delta Shoal	1919		
Reported Shipwreck	Unidentified Vessel	Florida Keys	1919		
Reported Shipwreck	Unidentified Vessel	Key West	1921		
Reported Shipwreck	Unidentified Vessel	South of Boca Chica	1921		
Reported Shipwreck	Unidentified Vessel	Key West	1926		
Reported Shipwreck	Unidentified Vessel	Key West	1928		

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Reported Shipwreck	Unidentified Vessel	South of Sambo Key	1942		
Reported Shipwreck	Unidentified Vessel		1948		
Reported Shipwreck	Unidentified Vessel	Several miles West of the Tortugas	1948		
Reported Shipwreck	Unidentified Vessel		1949		
Reported Shipwreck	Unidentified Vessel				
Reported Shipwreck	Unidentified Vessel	Craig Key			
Reported Shipwreck	Unidentified Vessel	Near Sand Key			
Reported Shipwreck	Unidentified Vessels	Caught in hurricane and many ships wrecked in Florida Keys	1589		
Reported Shipwreck	United States	Quicksands	1835		
Reported Shipwreck	Unity	Carysfort Reef off Key Largo	1817		
Reported Shipwreck	Unknown	Carysfort Reef	1819		
Reported Shipwreck	Valbanera	Halfmoon Shoal	1919		
Reported Shipwreck	Vengern	on Pickles Reef	1877		
Reported Shipwreck	Veto	Florida Reef	1877		
Reported Shipwreck	Vicentius Van Paulo	French Reef	1869		
Reported Shipwreck	Vidette	90 miles Southeast of Sand Island Light	1887		
Reported Shipwreck	Vigilant	Key West	1828		
Reported Shipwreck	Villanueva	Probably in Lower Florida Keys	1846		
Reported Shipwreck	Vineyard	Off Long Key on East side of the Bank	1830		
Reported Shipwreck	Virginia	Tennessee Reef	1872		
Reported Shipwreck	Virginia	Boca Chica	1910		
Reported Shipwreck	Visitacion	Florida Keys	1550		
Reported Shipwreck	Vito	Conch Reef	1877		
Reported Shipwreck	Volunteer	Sand Key	1905		
Reported Shipwreck	W. Empire	Tortugas	1855		

Reported Shipwreck	W. J. Colle	Key West	1930		
Reported Shipwreck	Waccaman (sp?)		1847		
Reported Shipwreck	Walter D. Walleth	Off Loggerhead Light bearing East by Northeast	1895		
Reported Shipwreck	Waltham	Middle Maticumbe Bar	1865		
Reported Shipwreck	Wanderer	Florida Bay near Money Key	1909		
Reported Shipwreck	Wandering Chief	Elbow Reef	1894		
Reported Shipwreck	Warsaw	Probably in Lower Florida Keys	1846		
Reported Shipwreck	Watt	Florida Keys	1815		
Reported Shipwreck	Waverly	Caesar's Creek	1831		
Reported Shipwreck	Weber, USS DE-675	Quicksands, West of Marquesas Keys	1962		
Reported Shipwreck	Wellington	Dry Tortugas Shoals	1844		
Reported Shipwreck	Wellwood, M/V		1984		
Reported Shipwreck	Western Empire	Florida Reef	1875		
Reported Shipwreck	Whalton		1858		
Reported Shipwreck	White Sea		1869		
Reported Shipwreck	William		1834		
Reported Shipwreck	William	Southward of Light	1834		
Reported Shipwreck	William Chesnut	Presumed to be in Lower Keys area	1859		
Reported Shipwreck	William Jarvis	Marquesas Key	1860		
Reported Shipwreck	William L. Springs		1867		
Reported Shipwreck	William M. Jones	Pulaski Shoal, 10 miles West-Southwest of Loggerhead Light, 5 miles South-Southwest of East Key, Tortugas	1877		
Reported Shipwreck	William R. Wilson	On Pickles Reef	1912		
Reported Shipwreck	William S. Fearwell	Miller Reef, on bank of the Tortugas.	1882		
Reported Shipwreck	William T. Dugan	Sand Key	1857		

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Reported Shipwreck	William Tell	Bird Key near the Tortugas Light	1831		
Reported Shipwreck	Wilmington	Outer part of reef, near Pickles	1873		
Reported Shipwreck	WM. B. (R?) Knighton	Florida Reef	1876		
Reported Shipwreck	Woodside		1852		
Reported Shipwreck	Y. P. 331	23.3 Nautical Miles North of Key West	1944		
Reported Shipwreck	Yagliona		1848		
Reported Shipwreck	YC 891	Off Key West	1943		
Reported Shipwreck	YC 898 & 899	Off Key West	1942		
Reported Shipwreck	YCK 8	Off Key West	1943		
Reported Shipwreck	Yeluman		1845		
Reported Shipwreck	Yole	Looe Key	1876		
Reported Shipwreck	York	Carysfort Reef	1846		
Reported Shipwreck	Yorktown		1859		
Reported Shipwreck	Yucatan	French Reef	1847		
Reported Shipwreck	Zotoff	Dry Tortugas, Southwest Reef	1844		

APPENDIX D

REGULATORY FRAMEWORK

Regulatory overview

This section presents the existing statutory and regulatory consultation requirements and compliance for the proposed action. Section D.1 presents the federal statutes that require NOAA/ONMS to coordinate or consult with another agency, or with NOAA's National Marine Fisheries Service. Section D.2 incorporates by reference Appendix C from the FKNMS 1996 final environmental impact statement, which describes the statutory or legal framework that was in place in the Florida Keys at the time of sanctuary designation. Section D.2 also notes a number of updates and additions to the federal and state laws included in Appendix C of the 1996 final EIS. Section D.3 presents a summary of the memoranda of agreement and understanding between NOAA and the state of Florida.

D.1 Statutory requirements and consultations

D.1.1 Endangered Species Act (16 U.S.C. §§ 1531 et seq.)

The Endangered Species Act (ESA) of 1973, as amended, provides for the conservation of species that are endangered or threatened throughout all or a significant portion of their range, and the conservation of the ecosystems on which they depend. The ESA directs all federal agencies to work to conserve endangered and threatened species and to use their authorities to further the purposes of the act. NMFS works with USFWS to manage ESA listed species. Generally, NMFS manages marine species, while USFWS manages land and freshwater species.

A species is considered endangered if it is in danger of extinction throughout all or a significant portion of its range. A species is considered threatened if it is likely to become an endangered species within the foreseeable future. When listing a species as threatened or endangered, NMFS or USFWS also designates critical habitat for the species to the maximum extent prudent and determinable (16 U.S.C. § 1533(a)(3)).

Section 7(a)(2) of the ESA states that each federal agency shall, in consultation with the Secretary of Commerce and/or Interior, insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. In fulfilling these requirements, each agency must use the best scientific and commercial data available. The consultation process is further developed in regulations promulgated at 50 CFR part 402.

The ESA requires action agencies to consult or confer with the USFWS and/or NMFS when there is discretionary federal involvement or control over the action. When a federal agency's action "may affect" a protected species, that agency is required to consult formally with NMFS or FWS, depending upon the endangered species, threatened species, or designated critical habitat that may be affected by the action (50 CFR § 402.14 (a)). Federal agencies are exempt from this general requirement if they have concluded that an action "may affect, but is not likely to adversely affect" endangered species, threatened species, or designated critical habitat and NMFS or the USFWS concurs with that conclusion (50 CFR § 402.14 (b)). This is commonly referred to as "informal consultation." This finding can be made only if *all* of the reasonably expected effects of the proposed action will be beneficial, insignificant, or discountable. An action agency shall confer with USFWS and/or NMSF if the action is likely to jeopardize the continued

existence of a proposed species or result in the destruction or adverse modification of proposed critical habitat.

Most consultations are conducted informally with the federal agency or a designated non-federal representative. When the biological assessment or other information indicates that the action has no likelihood of adverse effect (including evaluation of effects that may be beneficial, insignificant, or discountable), the services provide a letter of concurrence, which completes informal consultation. The agency is not required to prepare a biological assessment for actions that are not major construction activities, but, if a listed species or critical habitat is likely to be affected, the agency must provide the services with an account of the basis for evaluating the likely effects of the action.

In chapter 5, NOAA evaluated the potential impacts of the proposed action (i.e., expanding the boundary of the sanctuary, updating sanctuary-wide regulations, updating the individual marine zones and their associated regulations, and revising the sanctuary management plan) on federally listed species and critical habitats. During its review of the proposed expansion, NOAA/ONMS staff considered whether any federally listed, proposed, or candidate species or proposed or designated critical habitats may be present in the action area (as defined at 50 CFR § 402.02, “Definitions”) for the proposed action.

With respect to species under USFWS’s jurisdiction, USFWS identified 55 federally listed species, as well as designated critical habitat for nine of those species, which have the potential to occur in the vicinity of the action area in a letter to NOAA/ONMS dated June 3, 2019 (Appendix G). In Section 4.2.3.1.1 of this DEIS, NOAA/ONMS concluded that the listed terrestrial plants would not occur in the action area, and that one avian species would not occur in the action area because that species has been extirpated from the action area or no suitable habitat occurs within the action area. In addition, two species are listed because of similarity of appearance to other listed species and, therefore, are not subject to ESA Section 7 consultation. NOAA/ONMS evaluated the impacts to the remaining 30 species and designated critical habitat for nine of those species in Section 5.2.2.1.2 of this DEIS. For species and critical habitat under USFWS jurisdiction, NOAA/ONMS concluded that the proposed action would have no effect on 25 species; may affect, but is not likely to adversely affect 30 species; and is not likely to adversely modify any designated critical habitat.

With respect to species under NMFS’ jurisdiction, NOAA/ONMS identified 26 federally listed species on NMFS’ consultation lists for Florida’s Atlantic and Gulf coasts and determined that 23 of these species have the potential to occur within the action area. NMFS concurred with the list of species with the potential to occur within the action area during a technical assistance meeting on June 24, 2019. ONMS described these species in Section 4.2.3.1.1 of this DEIS and evaluated the potential impacts to these species in Section 5.2.2.1.2. NOAA/ONMS concluded that the proposed expansion may affect but is not likely to adversely affect these 23 species.

Upon publication of this DEIS, NOAA/ONMS will initiate informal consultation with USFWS and NMFS. NOAA/ONMS will request each agency to review and concur for review accompanied by a request for each agency to concur with NOAA/ONMS’ “may affect, but is not likely to adversely affect” determinations in accordance with 50 CFR § 402.12(j). NOAA/ONMS will update this section in the final EIS to include any correspondence transpiring between the issuance of this draft EIS and the final EIS.

D.1.2 Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §§ 1801 et seq.) - Essential Fish Habitat

In 1976, Congress passed the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The MSA fosters long-term biological and economic sustainability of the nation’s marine fisheries out to 200 nautical miles from shore. Key objectives of the MSA are to prevent overfishing, rebuild overfished stocks, increase long-term economic and social benefits, and ensure a safe and sustainable supply of seafood. The MSA promotes domestic commercial and recreational fishing under sound conservation and management principles and provides for the preparation and implementation, in accordance with national standards, of fishery management plans (FMPs).

Essential Fish Habitat (EFH) describes all waters and substrate necessary for fish for spawning, breeding, feeding, or growth to maturity. The consultation requirements of Section 305(b) of the MSA provide that:

- Federal agencies must consult with the Secretary on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH;
- the Secretary shall provide recommendations (which may include measures to avoid, minimize, mitigate, or otherwise offset adverse effects on EFH) to conserve EFH to federal or state agencies for activities that would adversely affect EFH; and
- the federal action agency must provide a detailed response in writing to NMFS and to any regional fishery management council commenting under Section 305(b)(3) of the MSA within 30 days after receiving an EFH conservation recommendation.

“Adverse effect” is defined in the regulations as: “any impact that reduces quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions” (50 CFR § 600.910).

The trigger for EFH consultation is a federal action agency’s determination that an action or proposed action, funded, authorized, or undertaken by that agency may adversely affect EFH. If a federal agency makes such a determination, then EFH consultation is required. If a federal action agency determines that an action does not meet the may adversely affect EFH test (i.e., the action will not adversely affect EFH), no consultation is required.

The Department of Commerce’s guidelines for implementing the EFH coordination and consultation provisions of the MSA are at 50 CFR §§ 600.905-930. These guidelines provide definitions and procedures for satisfying the EFH consultation requirements, which include the use of existing environmental review processes, general concurrences, programmatic consultations, or individual EFH consultations (i.e., abbreviated, expanded) when an existing process is not available. The EFH guidelines also address coordination with the councils, NMFS EFH conservation recommendations to federal and state agencies, and council comments and recommendations to federal and state agencies.

During its review of the proposed sanctuary expansion, NOAA/ONMS identified where within the proposed expansion area and existing FKNMS boundary there is EFH (see Chapter 4). During a technical assistance meeting on June 25, 2019, NMFS concurred that NOAA/ONMS had identified all of the EFH occurring in the proposed action area. NOAA/ONMS determined that the proposed action would have both beneficial and minimal adverse impacts to EFH in the sanctuary. The anticipated minimal adverse impacts to EFH in the sanctuary is due to a limited number of activities that would result in direct habitat degradation or disturbance (see Chapter 5).

Upon publication of this DEIS, NOAA/ONMS will consult with NMFS and request NMFS' concurrence with NOAA/ONMS' "minimal adverse" effects determination. NOAA/ONMS will update this section in the final EIS to include any correspondence transpiring between the issuance of this draft EIS and the final EIS.

D.1.3 Marine Mammal Protection Act of 1972 (16 U.S.C. §§ 1361 *et seq.*)

The Marine Mammal Protection Act (MMPA), as amended, prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S. The MMPA defines "take" as: "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture or kill any marine mammal" (16 U.S.C. § 1362). Harassment means any act of pursuit, torment, or annoyance that has the *potential to injure* a marine mammal or marine mammal stock in the wild (Level A harassment); or that has the *potential to disturb* a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering, but does not have the potential to injure a marine mammal or marine mammal stock in the wild (Level B harassment) (16 U.S.C. § 1362).

Section 101(a)(5)(A-D) of the MMPA provides a mechanism for allowing, upon request, the "incidental," but not intentional, taking, of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing or directed research on marine mammals) within a specified geographic region. The NMFS Office of Protected Resources processes applications for incidental takes of small numbers of marine mammals. Authorization for incidental takes may be granted if NMFS finds that the taking would be of small numbers, have no more than a "negligible impact" on those marine mammal species or stocks, and not have an "unmitigable adverse impact" on the availability of the species or stock for "subsistence" uses. NMFS issuance of an incidental take authorization also requires NMFS to make determinations under NEPA and Section 7 of the ESA.

NOAA/ONMS determined that the proposed action would not cause the take of any marine mammal protected under the MMPA. Section 4.2.3.3 describes the marine mammals protected under the Endangered Species Act (ESA) and Section 5.2.2.1 evaluates the impacts to marine mammals protected under the ESA. In addition, Section 4.2.2.2 describes marine mammals not protected under the ESA and Chapter 5 describes impacts to marine mammals not protected under the ESA. Should NOAA/ONMS conduct, permit, or authorize any future activities that would cause the take of any marine mammal protected under the MMPA, NOAA/ONMS would evaluate the environmental impacts from such activities on a case-by-case basis.

D.1.4 Coastal Zone Management Act (16 U.S.C. §§ 1451 *et seq.*)

The Coastal Zone Management Act (CZMA) was enacted in 1972 to encourage coastal states to preserve, protect, develop, and where possible, to restore or enhance the resources of the nation’s coastal zone. The federal consistency provision of CZMA requires federal actions (inside or outside a state’s coastal zone) that affect any land or water use or natural resource of a state’s coastal zone to be consistent with the enforceable policies of the state coastal management program. The term “effect on any coastal use or resource” means any reasonably foreseeable effect on any coastal use or resource resulting from the activity, including direct and indirect (cumulative and secondary) effects. The federal consistency regulations at 15 CFR part 930 set forth detailed timeframes and procedures that must be followed carefully.

Part 930 subpart C of the federal consistency regulations applies to federal agency activities and requires a federal agency to submit a consistency determination to the state coastal management program if the federal agency determines that its activity may have reasonably foreseeable effects—including direct, indirect, cumulative, adverse, or beneficial effects—on the state’s coastal uses or resources. Federal agency activities must be consistent to the maximum practicable with the enforceable policies of the state’s coastal management program.

NOAA/ONMS will be submitting a consistency determination to the Florida Coastal Management Program upon publication of this DEIS. NOAA/ONMS staff will update this section in the final EIS to include any correspondence transpiring between the issuance of this draft EIS and the final EIS.

D.1.5 National Historic Preservation Act of 1966 (54 U.S.C. §§ 100101 *et seq.*)

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires federal agencies to take into account the effects of their undertakings on historic properties in accordance with regulations issued by the Advisory Council on Historic Preservation (ACHP) at 36 CFR part 800. The regulations require that federal agencies consult with states, tribes, and other interested parties (consulting parties) when making their effects determinations.

The regulations establish four basic steps in the NHPA 106 process: (1) determine if the undertaking is the type of activity that could affect historic properties; (2) identify historic properties in the area of potential effects (APE); (3) assess potential effects; and (4) avoid, mitigate, or minimize adverse effects. Historic properties are properties that are included in the National Register of Historic Places or that are eligible for listing. The agency must identify the appropriate state historic preservation officer/tribal historic preservation officer (SHPO/THPO) to consult with during the process.

After determining that the proposed action is a type of activity that could potentially affect historic properties, NOAA/ONMS identified historic properties within the APE (i.e., the proposed FKNMS boundary expansion area) (see Appendix C). NOAA/ONMS determined that the proposed action will have no adverse effects on the historic properties within the APE. Upon publication of this draft EIS, NOAA/ONMS will consult with the Florida SHPO and tribes that may attach religious or cultural significance to historic properties in the APE to seek the SHPO’s and THPO’s concurrence with NOAA/ONMS’ determination.

In addition, over the past several years, NOAA has been working closely with the Florida SHPO and the ACHP to develop a draft Section 106 Programmatic Agreement that sets forth a process by which ONMS

intends to comply with Section 106 and its implementing regulations (36 CFR part 800). In addition, ONMS has initiated consultation with the Seminole Nation of Oklahoma and has provided an opportunity for consultation with the Seminole Tribe of Florida and the Miccosukee Tribe of Florida. As part of the public comment period on this DEIS, NOAA/ONMS is also seeking public comment on the draft Programmatic Agreement and intends to consult further with interested parties, including current FKNMS permit holders. NOAA/ONMS staff will update this section and the draft Programmatic Agreement in the final EIS to include any correspondence transpiring between the issuance of this draft EIS and the final EIS, and to address any public comments received on the draft Programmatic Agreement.

D.1.6 Migratory Bird Treaty Act (16 U.S.C. §§ 703 *et seq.*)

The Migratory Bird Treaty Act of 1918 (MBTA) implements the United States' commitment to bilateral treaties, or conventions, with Great Britain, Canada, Japan, Russia, and Mexico for the protection of shared migratory bird resources. The MBTA establishes that it is unlawful to pursue, hunt, take, capture, kill, possess, sell, purchase, barter, import, export, or transport any migratory bird, or any part, nest, or egg of any such bird, unless authorized under a permit issued by the Secretary of the Interior. Take is defined in regulations as: "pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect." The MBTA protects over 800 species of birds that occur in the United States, and the list of migratory bird species protected by the MBTA is set forth in 50 CFR § 10.13. USFWS issues permits for scientific collecting, banding and marking, falconry, raptor propagation, depredation, import, export, taxidermy, waterfowl sale and disposal, and special purposes. USFWS has also developed, and continues to develop, voluntary guidance that helps project proponents reduce incidental take of migratory birds.

Appendix E includes a description of the migratory birds that may occur within the proposed action area. See Chapter 5, Section 5.2.3.1.2.

D.1.7 Executive Order 13795 (April 28, 2017), Implementing an America-First Offshore Energy Strategy.

On April 28, 2017, President Trump signed Executive Order 13795: Implementing an America-First Offshore Energy Strategy. Section 4(a) of E.O. 13795 requires the Secretary of Commerce (acting through NOAA) to receive from the Department of the Interior (DOI) a full accounting of the energy or mineral resource potential of any area proposed for sanctuary designation or expansion, including information on the potential impact the proposed designation or expansion will have on the development of those resources.

On August 14, 2018, NOAA sent DOI a letter providing notice of the NOAA's proposal to expand the FKNMS boundary pursuant to the NMSA (16 U.S.C. §§ 1431 *et seq.*), and requesting that DOI evaluate the energy and mineral resource potential and impact of this proposed expansion. On October 24, 2018, DOI responded to NOAA with a completed review of the potential impacts the proposed expansion would have on the development of resources under the jurisdiction of the Bureau of Ocean Energy Management. See Appendix G for the October 24, 2018 response from DOI. Information pursuant to this directive is included in Section 4.6 of this DEIS.

D.2 Updates to the legal framework included in Appendix C of the FKNMS 1996 final environmental impact statement

As noted above, this draft EIS incorporates by reference Appendix C from the FKNMS 1996 final environmental impact statement, which describes the statutory or legal framework that was in place in the Florida Keys at the time of sanctuary designation. Below are a number of updates and additions to the federal and state laws that were included in Appendix C of the 1996 final EIS.

D.2.1 Updates to federal authorities

In addition to the federal authorities described in Appendix C of the 1996 final EIS, the following federal statutes make up the statutory framework for FKNMS:

- Archaeological Resources Protection Act of 1979, 16 U.S.C. §§ 470aa *et seq.*
- Antiquities Act of 1906, 54 U.S.C. §§ 320301 *et seq.*
- Native American Graves Protection and Repatriation Act, 25 U.S.C. §§ 3001 *et seq.*
- Sunken Military Craft Act of 2004, Title XIV of the Ronald W. Reagan National Defense Authorization Act for FY2005 (Pub. L. No. 108-375)
- Energy Policy Act of 2005, 42 U.S.C. §§ 15801 *et seq.*
- Marine Debris Act, 33 U.S.C. §§ 1951 *et seq.*
- National Historic Lighthouse Preservation Act, 54 U.S.C. §§ 305101-305106 (this statute amends the National Historic Preservation Act of 1966, 54 U.S.C. §§ 300101 *et seq.*)

Further, the updated or corrected citations below apply to the following federal statutes that were included in Appendix C of the 1996 final EIS:

- Endangered Species Act, 16 U.S.C. §§ 1531 *et seq.*
- Ports and Waterways Safety Act, 46 U.S.C. Subtitle VII, Ch. 700
- Act to Prevent Pollution from Ships, as amended by the Marine Plastic Pollution Research and Control Act of 1987 (33 U.S.C. §§ 1901 *et seq.*)
- Federal Aviation Act of 1958, 49 U.S.C. §§ 40101 *et seq.*

D.2.2 Updates to state authorities

In addition to the state of Florida authorities described in Appendix C of the 1996 final EIS, the following additional state statutory sections are particularly relevant to the management of FKNMS, as discussed in Chapter 3 of this draft EIS:

- Florida Statute 327.395 (Boating safety identification cards)
- Florida Statute 403.93345 (Florida Coral Reef Protection Act)
- Florida Statute 823.11 (Derelict vessels; relocation or removal; penalty)
- Florida Administrative Code 68B-5.005 (Divers: Fish Feeding Prohibited; Prohibition of Fish Feeding for Hire; Definitions)

Further, the updated information below applies to the following state statutes that were included in Appendix C of the 1996 final EIS:

- Florida ACSC Restoration Trust Fund Act, sections 380.0558 *et seq.* (REPEALED)
- Florida Wetlands Protection Act, Title 29, Public Health, Chapter 403, Environmental Control, sections 403.91 - 403.929 (known as the Warren S. Henderson Wetlands Protection Act of 1984). (REPEALED, except 403.927). Wetlands protection is addressed in Florida Statute Title XXVIII, Ch. 373.403-468 (Management and Storage of Surface Waters).
- A number of Florida Administrative Code sections cited in Appendix C of the 1996 final EIS have been relocated from Chapter 17 to Chapter 62 of the Florida Administrative Code.

D.3 Regulatory overview: Memoranda of agreement and understanding pertaining to sanctuary management

Florida Keys National Marine Sanctuary has entered into a number of memoranda of agreement and understanding with partner state and federal agencies to facilitate cooperative management and enforcement within the sanctuary. As part of the sanctuary’s effort to revise the sanctuary management plan, the sanctuary intends to review these existing agreements and work with partners to update them as needed.

D.3.1 Co-trustees agreement for cooperative management

This agreement clarifies the relative jurisdiction, authority, and conditions of the state of Florida and NOAA in the co-trustee management of FKNMS. In 1992, NOAA and the governor and cabinet of Florida (the “Co-Trustees”) entered into a cooperative agreement concerning the development of the sanctuary's comprehensive management plan. Following development of the management plan, the agreement was updated in 1997. The agreement clarifies the state’s continuing authority and jurisdiction over submerged lands and other state resources within the sanctuary and outlines provisions for how NOAA and the state will cooperatively manage the sanctuary and sanctuary resources consistent with the management plan on specific issues such as regulatory amendments, permits, and civil claims, among other issues.

D.3.2 Cooperative enforcement agreement

This agreement establishes an enforcement regime for FKNMS between NOAA and the Florida Fish and Wildlife Conservation Commission. Implemented in 1999, this agreement establishes the procedures and mechanisms for coordinating state and federal law enforcement operations within the sanctuary. State law enforcement officers designated as federal law enforcement agents are authorized to enforce the authorities and regulations established under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), Marine Mammal Protection Act (MMPA), Endangered Species Act (ESA), Lacey Act, National Marine Sanctuaries Act (NMSA), and the Florida Keys National Marine Sanctuary and Protection Act (FKNMSPA). Actions taken (in conjunction with NMFS special agents) include warnings, seizure of domestic vessels and cargo, and arrests for violations of the acts. No arrests or seizures of foreign vessels can be made by FWC without the knowledge and consent of the U.S. Coast Guard and/or NMFS special agents.

D.3.3 Agreement for the coordination of civil claims

This agreement outlines cooperation and coordination among NOAA and the state of Florida with respect to civil claims for response costs or damages based on injury to sanctuary resources. The procedures and

mechanisms established for state and federal civil claims for damages to sanctuary resources, include: (a) initial notification and response, (b) incident screening, (c) coordination of joint and other civil claims, (d) coordination of policy, and (e) the use of recovered sums.

D.3.4 Protocol for cooperative fisheries management

This agreement describes management and regulation of fishing activities within FKNMS between NOAA and the state of Florida. This agreement recognizes fisheries management authorities' continuation of management of fisheries under state law, the Magnuson-Stevens Fishery Conservation and Management Act, and other federal laws. The protocol is intended to address the recognized problem of inconsistent regulations within South Florida waters. Specifically, the protocol allows for fishing regulations to occur under FKNMS regulations and/or under Magnuson-Stevens Fishery Conservation and Management Act authority. The protocol also notes that if there is consensus, federal and state fishery management authorities may agree to develop uniform fishing regulations for South Florida species in state and federal waters of both the Gulf of Mexico and South Atlantic, including within FKNMS. Originally implemented in 1997, the protocol was signed by Florida Marine Fisheries Commission, NMFS, and the National Ocean Service.

D.3.5 Certification/authorization of permits agreement

This agreement establishes the procedures and mechanisms for addressing state authorization of activities prohibited by sanctuary regulations. As finalized, the purpose of this agreement is to streamline the process of issuing permits related to the collection of all coral species, sea fans (*Gorgonia* spp.), live rock, and live sand in FKNMS.

D.3.6 Memorandum of agreement for recreational fishing and boating

The purpose of this memorandum of agreement is to develop and expand a framework of cooperation among the participating parties, which comprise: NOAA ONMS and NMFS, the Association of Fish and Wildlife Agencies, the American Sportfishing Association, the National Marine Manufacturers Association, and the Recreational Boating and Fishing Foundation, for planning and implementing mutually beneficial projects and activities to promote sustainable fishing and boating conducted within federal marine waters, including national marine sanctuaries. These activities and projects will complement the respective missions of the parties and serve the mutual interests of these groups and the public.

D.3.7 Management agreement for submerged lands within boundaries of the Key West and Great White Heron national wildlife refuges

This agreement provides USFWS the right to manage for public purposes all lands titled in the Trustees of the Internal Improvement Trust Fund of the State of Florida (including islands, tidal lands, and sovereignty submerged lands) which are located within the boundaries of Key West National Wildlife Refuge and Great White Heron National Wildlife Refuge.

APPENDIX E

FLORIDA KEYS NATIONAL MARINE SANCTUARY LISTED SPECIES

USFWS ESA listed species

Type	Common name	Species	Status	Life history	Conclusion
Mammals	Florida bonneted bat	<i>Eumops floridanus</i>	Endangered	Area with the most likely probability of occurrence would include the shorelines of Card and Barnes Sounds and may possibly occur in transit over open water between coastal islands (range listed as M-D County, not Monroe). Habitat described in FWS biological opinion: wetland and upland shrub and forest, open water, and fresh water of South Florida.	May affect, not likely to adversely affect
	Florida panther	<i>Puma concolor coryi</i>	Endangered	Area with the most likely probability of occurrence would include the shoreline of Card and Barnes Sounds, possibly Key Largo, and in open water when transiting between coastal islands.	May affect, not likely to adversely affect
	Key deer	<i>Odocoileus virginianus clavium</i>	Endangered	Area with the most likely probability of occurrence would be the lower Keys and in transit in open water between islands - actions would be beneficial - protect shorelines from disturbance.	May affect, not likely to adversely affect
	Key Largo cotton mouse	<i>Peromyscus gossypinus allapaticola</i>	Endangered	Potentially found on shorelines.	May affect, not likely to adversely affect
	Key Largo woodrat	<i>Neotoma floridana smalli</i>	Endangered	Potentially found on shorelines.	May affect, not likely to adversely affect
	Lower Keys marsh rabbit	<i>Sylvilagus palustris hefneri</i>	Endangered	Potentially found on shorelines.	May affect, not likely to adversely affect
	Puma (mountain lion)	<i>Felis concolor</i> (all subsp. except <i>coryi</i>)	SAT	N/a	N/a
	Rice rat	<i>Oryzomys palustris natator</i>	Endangered	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	May affect, not likely to adversely affect

	West Indian manatee	<i>Trichechus manatus</i>	Threatened	<ul style="list-style-type: none"> - May be found throughout aquatic parts of action area. Agency actions would protect shorelines and shallow seagrass flat areas from disturbance, and limit vessel access and speeds to reduce strikes and damage to seagrass feeding habitats. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities. Small vessel operations would be at slow speeds unlikely to endanger. 	May affect, not likely to adversely affect
Birds	Bachman's warbler	<i>Vermivora bachmanii</i>	Endangered	<ul style="list-style-type: none"> - Potentially found on forested shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities. 	May affect, not likely to adversely affect
	Cape Sable seaside sparrow	<i>Ammodramus maritimus mirabilis</i>	Endangered	<ul style="list-style-type: none"> - Potentially found on forested shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities. 	May affect, not likely to adversely affect
	Everglade snail kite	<i>Rostrhamus sociabilis plumbeus</i>	Endangered	<ul style="list-style-type: none"> - Potentially found on forested shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities. 	May affect, not likely to adversely affect
	Florida grasshopper sparrow	<i>Ammodramus savannarum floridanus</i>	Endangered	<ul style="list-style-type: none"> - Potentially found on shorelines of Card and Barnes Sounds and may possibly occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities. 	May affect, not likely to adversely affect
	Florida scrub-jay	<i>Aphelocoma coerulescens</i>	Threatened	<ul style="list-style-type: none"> - Potentially found on shorelines of Card and Barnes Sounds and may possibly occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities. 	May affect, not likely to adversely affect
	Ivory-billed woodpecker	<i>Campephilus principalis</i>	Endangered	<ul style="list-style-type: none"> - Very low potential for occurrence on shorelines or in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities. 	<ul style="list-style-type: none"> - Not likely to affect - Low probability of occurrence; this species is presumed extinct other than

					a few possible sightings in northern FL and AR.
	Kirtland's warbler	<i>Setophaga kirtlandii</i>	Endangered	- Potentially found on shorelines of Card and Barnes Sounds and may possibly occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	May affect, not likely to adversely affect
	Piping plover	<i>Charadrius melodus</i>	Threatened	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	May affect, not likely to adversely affect
	Red knot	<i>Calidris canutus rufa</i>	Threatened	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	May affect, not likely to adversely affect
	Red-cockaded woodpecker	<i>Picoides borealis</i>	Endangered	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	May affect, not likely to adversely affect
	Roseate tern	<i>Sterna dougallii dougallii</i>	Threatened	- May be found on shorelines and may occur in transit over open water between coastal islands. Potentially nesting on beaches and flat ground or rooftops. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	May affect, not likely to adversely affect
	Wood stork	<i>Mycteria americana</i>	Threatened	- Potentially found foraging and nesting on shorelines and coastal wetlands and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	- May affect, not likely to adversely affect - This species prefers deeper freshwater estuarine habitats than are found in most of the action area, other than the mainland

					shorelines of Barnes and Card Sounds.
Reptiles	American alligator	<i>Alligator mississippiensis</i>	SAT - "threatened due to similarity of appearance."	- Potentially found on shorelines and coastal wetlands near the mainland and may occur in transit in open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	N/a
	American crocodile	<i>Crocodylus acutus</i>	Threatened	- May be found throughout upper Keys and Card and Barnes Sounds parts of action area. - Agency actions would protect shorelines and shallow water from disturbance, and limit vessel access and speeds to reduce strikes and damage to seagrass and mangrove feeding habitats.	May affect, not likely to adversely affect
	Eastern indigo snake	<i>Drymarchon corais couperi</i>	Threatened	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	May affect, not likely to adversely affect
	Hawksbill sea turtle	<i>Eretmochelys imbricata</i>	Endangered	- May be found on beaches nesting or hatching or transiting and foraging in open water. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities. - Management activities by vessel would be conducted to reduce strikes and damage to seagrass feeding habitats.	May affect, not likely to adversely affect
	Leatherback sea turtle	<i>Dermochelys coriacea</i>	Endangered	- May be found on beaches nesting or hatching or transiting and foraging in open water. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities. - Management activities by vessel would be conducted to reduce strikes.	May affect, not likely to adversely affect
	Loggerhead sea turtle	<i>Caretta caretta</i>	Threatened	- May be found on beaches nesting or hatching or transiting and foraging in open water. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	May affect, not likely to adversely affect

				- Management activities by vessel would be conducted to reduce strikes and damage to seagrass feeding habitats.	
Fishes	Atlantic sturgeon (gulf subspecies)	<i>Acipenser oxyrinchus (oxyrhyinchus) desotoi</i>	Threatened	- Known or believed to occur in Monroe County, but limited estuarine habitat for juveniles or spawning adults. - Actions would be mostly beneficial to reduce disturbance, minimal disturbance from management activities. - Management activities by vessel would be conducted to reduce strikes.	May affect, not likely to adversely affect
Snails	Stock Island tree snail	<i>Orthalicus reses</i> (not incl. <i>nesodryas</i>)	Threatened	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	May affect, not likely to adversely affect
Insects	Bartram's hairstreak butterfly	<i>Strymon acis bartrami</i>	Endangered	- Potentially found on shorelines and may possibly occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	May affect, not likely to adversely affect
	Florida leafwing butterfly	<i>Anaea troglodyta floridaalis</i>	Endangered	- Potentially found on shorelines and may possibly occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	May affect, not likely to adversely affect
	Miami blue butterfly	<i>Cyclargus (Hemiargus) thomasi bethunebakeri</i>	Endangered	- Potentially found on shorelines and may possibly occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	May affect, not likely to adversely affect
	Schaus swallowtail butterfly	<i>Heraclides aristodemus ponceanus</i>	Endangered	- Potentially found on shorelines and may possibly occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce	May affect, not likely to adversely affect

				disturbance; minimal disturbance from management activities.	
Flowering Plants	Beach jacquemontia	<i>Jacquemontia reclinata</i>	Endangered	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
	Big Pine partridge pea	<i>Chamaecrista lineata keyensis</i>	Endangered	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
	Blodgett's silverbush	<i>Argythamnia blodgettii</i>	Threatened	- Potentially found on shorelines in low, moist limestone areas near margins of pine rocklands, sunny edges and gaps in pine rocklands, rockland hammocks, and coastal berm. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
	Cape Sable thoroughwort	<i>Chromolaena frustrata</i>	Endangered	- Potentially found on shorelines in buttonwood hammocks and coastal hardwood hammocks. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
	Carter's mustard	<i>Warea carteri</i>	Endangered	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
	Carter's small-flowered flax	<i>Linum carteri carteri</i>	Endangered	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
	Crenulate lead-plant	<i>Amorpha crenulata</i>	Endangered	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
	Deltoid spurge	<i>Chamaesyce deltoidea</i> ssp. <i>deltoidea</i>	Endangered	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce	Would not affect

				disturbance; minimal disturbance from management activities.	
	Everglades bully	<i>Sideroxylon reclinatum</i> ssp. <i>austrofloridense</i>	Threatened	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
	Florida Brickell-bush	<i>Brickellia mosieri</i>	Endangered	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
	Florida pineland crabgrass	<i>Digitaria pauciflora</i>	Threatened	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
	Florida prairie-clover	<i>Dalea carthagenensis floridana</i>	Endangered	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
	Florida semaphore cactus	<i>Consolea corallicola</i>	Endangered	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
	Garber's spurge	<i>Chamaesyce garberi</i>	Threatened	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
	Key tree cactus	<i>Pilosocereus robinii</i>	Endangered	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
	Okeechobee gourd	<i>Cucurbita okeechobeensis</i> ssp. <i>okeechobeensis</i>	Endangered	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
	Pineland sandmat	<i>Chamaesyce deltoidea pinetorum</i>	Threatened	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce	Would not affect

				disturbance; minimal disturbance from management activities.	
	Sand flax	<i>Linum arenicola</i>	Endangered	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
	Small's milkpea	<i>Galactia smallii</i>	Endangered	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
	Tiny polygala	<i>Polygala smallii</i>	Endangered	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
	Wedge spurge	<i>Chamaesyce deltoidea serpyllum</i>	Endangered	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
Ferns and Allies	Florida bristle fern	<i>Trichomanes punctatum</i> ssp. <i>floridanum</i>	Endangered	- Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Would not affect
Critical habitats	American Crocodile	<i>Crocodylus acutus</i>		- May be found throughout upper Keys and Card and Barnes Sounds parts of action area. - Agency actions would protect shorelines and shallow water from disturbance, and limit vessel access and speeds to reduce strikes and damage to seagrass and mangrove feeding habitats.	
	Bartram's hairstreak butterfly	<i>Strymon acis bartrami</i>		Big Pine Key - limit shoreline disturbance	
	Cape Sable thoroughwort	<i>Chromolaena frustrata</i>		Throughout Keys - limit shoreline disturbance	
	Florida leafwing butterfly	<i>Anaea troglodyta floralis</i>		Big Pine Key - limit shoreline disturbance	

	Florida semaphore cactus	<i>Consolea corallicola</i>		Big Pine and upper keys - limit shoreline disturbance	
	Loggerhead sea turtle	<i>Caretta caretta</i>		<ul style="list-style-type: none"> - May be found on beaches nesting or hatching or transiting and foraging in open water. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities. - Management activities by vessel would be conducted to reduce strikes and damage to seagrass feeding habitats. 	
	Piping plover	<i>Charadrius melodus</i>		<ul style="list-style-type: none"> - May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities. 	
	Rice rat	<i>Oryzomys palustris natator</i>		<ul style="list-style-type: none"> - Potentially found on shorelines. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities. 	
	West Indian manatee	<i>Trichechus manatus</i>		<ul style="list-style-type: none"> - May be found throughout aquatic parts of action area. - Agency actions would protect shorelines and shallow seagrass areas from disturbance, and limit vessel access and speeds to reduce strikes and damage to seagrass feeding habitats. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities. Small vessel operations would be at slow speeds unlikely to endanger. 	

USFWS migratory birds (56)

Key: BCC: USFWS Birds of Conservation Concern

BCR: BCC only in Bird Conservation Region

CON: BCC throughout range

Non-BCC Vulnerable: not BCC but warrants attention due to Eagle Act or from potential offshore activities

Common name	Species	Status	Notes on range and effects	Probability of effect	Frequency of onsite observations	Onsite habitat use
American kestrel	<i>Falco sparverius paulus</i>	BCC - BCR	Breeds Apr 1 to Aug 31	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
American oystercatcher	<i>Haematopus palliatus</i>	BCC Rangewide (CON)	Breeds Apr 15 to Aug 31	- May be found on shorelines and over open water in sanctuary. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Arctic tern	<i>Sterna paradisaea</i>	Non-BCC Vulnerable	Breeds May 20 to Aug 15	- May be found on shorelines and over open water in sanctuary. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Rarely	
Audubon's shearwater	<i>Puffinus lherminieri</i>	BCC Rangewide (CON)	Breeds Mar 1 to Aug 5	- May be found over open water in sanctuary. - Minimal disturbance from management activities.	Rarely	
Bald eagle	<i>Haliaeetus leucocephalus</i>	Non-BCC Vulnerable	Breeds Sep 1 to Jul 31	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging

Appendix E: FKNMS listed species

Band-rumped storm-petrel	<i>Oceanodroma castro</i>	BCC Rangewide (CON)	Breeds elsewhere	- May be found over open water in sanctuary. - Minimal disturbance from management activities.	Rarely	
Black scoter	<i>Melanitta nigra</i>	Non-BCC Vulnerable	Breeds elsewhere	- May be found over open water in sanctuary. - Minimal disturbance from management activities.	Occasionally	Resting, foraging
Black skimmer	<i>Rynchops niger</i>	BCC Rangewide (CON)	Breeds May 20 to Sep 15	- May be found on shorelines and over open water in sanctuary. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Black-legged kittiwake	<i>Rissa tridactyla</i>	Non-BCC Vulnerable	Breeds elsewhere	- May be found on shorelines and over open water in sanctuary. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Black-whiskered vireo	<i>Vireo altiloquus</i>	BCC - BCR	Breeds May 1 to Aug 15	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Bonaparte's gull	<i>Chroicocephalus philadelphia</i>	Non-BCC Vulnerable	Breeds elsewhere	- May be found on shorelines and over open water in sanctuary. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Bridled tern	<i>Onychoprion anaethetus</i>	Non-BCC Vulnerable	Breeds Apr 15 to Sep 20	- May be found on shorelines and over open water in sanctuary. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Brown pelican	<i>Pelecanus occidentalis</i>	Non-BCC Vulnerable	Breeds Jan 15 to Sep 30	- May be found on shorelines and in open water in sanctuary. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Frequently	Resting, foraging, breeding

Appendix E: FKNMS listed species

Clapper rail	<i>Rallus crepitans</i>	BCC - BCR	Breeds Apr 10 to Oct 31	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Common ground-dove	<i>Columbina passerina exigua</i>	BCC - BCR	Breeds Feb 1 to Dec 31	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Common loon	<i>Gavia immer</i>	Non-BCC Vulnerable	Breeds Apr 15 to Oct 31	- May be found on shorelines and in open water in sanctuary. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Common tern	<i>Sterna hirundo</i>	Non-BCC Vulnerable	Breeds May 10 to Sep 10	- May be found on shorelines and over open water in sanctuary. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Cory's shearwater	<i>Calonectris diomedea</i>	Non-BCC Vulnerable	Breeds elsewhere	- May be found over open water in sanctuary. - Minimal disturbance from management activities.	Occasionally	Resting, foraging
Double-crested cormorant	<i>Phalacrocorax auritus</i>	Non-BCC Vulnerable	Breeds Apr 20 to Aug 31	- May be found on shorelines and in open water in sanctuary. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Frequently	Resting, foraging, breeding
Dunlin	<i>Calidris alpina arctica</i>	BCC - BCR	Breeds elsewhere	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Great black-backed gull	<i>Larus marinus</i>	Non-BCC Vulnerable	Breeds Apr 15 to Aug 20	- May be found on shorelines and in open water in sanctuary.	Frequently	Resting, foraging

Appendix E: FKNMS listed species

				- Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.		
Great shearwater	<i>Puffinus gravis</i>	Non-BCC Vulnerable	Breeds elsewhere	- May be found over open water in sanctuary. - Minimal disturbance from management activities.	Occasionally	Resting, foraging
Herring gull	<i>Larus argentatus</i>	Non-BCC Vulnerable	Breeds Apr 20 to Aug 31	- May be found on shorelines and in open water in sanctuary. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Frequently	Resting, foraging
Least tern	<i>Sterna antillarum</i>	BCC - BCR	Breeds Apr 20 to Sep 10	- May be found on shorelines and in open water in sanctuary. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Frequently	Resting, foraging
Lesser yellowlegs	<i>Tringa flavipes</i>	BCC Rangewide (CON)	Breeds elsewhere	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Limpkin	<i>Aramus guarauna</i>	BCC Rangewide (CON)	Breeds Jan 15 to Aug 31	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Magnificent frigatebird	<i>Fregata magnificens</i>	BCC Rangewide (CON)	Breeds Oct 1 to Apr 30	- May be found on shorelines and over open water in sanctuary. - Minimal disturbance from management activities.	Frequently	Resting, foraging, breeding
Mangrove cuckoo	<i>Coccyzus minor</i>	BCC Rangewide (CON)	Breeds Apr 20 to Aug 20	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging

Manx shearwater	<i>Puffinus puffinus</i>	Non-BCC Vulnerable	Breeds Apr 15 to Oct 31	- May be found over open water in sanctuary. - Minimal disturbance from management activities.	Occasionally	Resting, foraging
Nelson's sparrow	<i>Ammodramus nelsoni</i>	BCC Rangewide (CON)	Breeds elsewhere	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Northern gannet	<i>Morus bassanus</i>	Non-BCC Vulnerable	Breeds elsewhere	- May be found in and over open water in sanctuary. - Minimal disturbance from management activities.	Occasionally	Resting, foraging
Parasitic jaeger	<i>Stercorarius parasiticus</i>	Non-BCC Vulnerable	Breeds elsewhere	- May be found in and over open water in sanctuary. - Minimal disturbance from management activities.	Rarely	
Pomarine jaeger	<i>Stercorarius pomarinus</i>	Non-BCC Vulnerable	Breeds elsewhere	- May be found in and over open water in sanctuary. - Minimal disturbance from management activities.	Rarely	
Prairie warbler	<i>Dendroica discolor</i>	BCC Rangewide (CON)	Breeds May 1 to Jul 31	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Rarely	
Prothonotary warbler	<i>Protonotaria citrea</i>	BCC Rangewide (CON)	Breeds Apr 1 to Jul 31	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Rarely	
Razorbill	<i>Alca torda</i>	Non-BCC Vulnerable	Breeds Jun 15 to Sep 10	- May be found in and over open water in sanctuary. - Minimal disturbance from management activities.	Rarely	

Red-breasted merganser	<i>Mergus serrator</i>	Non-BCC Vulnerable	Breeds elsewhere	- May be found on shorelines and in open water in sanctuary. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Rarely	
Red-necked phalarope	<i>Phalaropus lobatus</i>	Non-BCC Vulnerable	Breeds elsewhere	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Rarely	
Reddish egret	<i>Egretta rufescens</i>	BCC Rangewide (CON)	Breeds Mar 1 to Sep 15	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Ring-billed gull	<i>Larus delawarensis</i>	Non-BCC Vulnerable	Breeds elsewhere	- May be found on shorelines and in open water in sanctuary. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Frequently	Resting, foraging
Roseate tern	<i>Sterna dougallii</i>	Non-BCC Vulnerable	Breeds May 10 to Aug 31	- May be found on shorelines and in open water in sanctuary. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Frequently	Resting, foraging
Royal tern	<i>Thalasseus maximus</i>	Non-BCC Vulnerable	Breeds Apr 15 to Aug 31	- May be found on shorelines and in open water in sanctuary. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Frequently	Resting, foraging
Ruddy turnstone	<i>Arenaria interpres morinella</i>	BCC - BCR	Breeds elsewhere	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging

Appendix E: FKNMS listed species

Semipalmated sandpiper	<i>Calidris pusilla</i>	BCC Rangewide (CON)	Breeds elsewhere	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Short-billed dowitcher	<i>Limnodromus griseus</i>	BCC Rangewide (CON)	Breeds elsewhere	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Short-tailed hawk	<i>Buteo brachyurus</i>	BCC - BCR	Breeds Mar 1 to Jun 30	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Smooth-billed ani	<i>Crotophaga ani</i>	BCC - BCR	Breeds Jan 1 to Dec 31	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Sooty tern	<i>Onychoprion fuscatus</i>	Non-BCC Vulnerable	Breeds Mar 10 to Jul 31	- May be found on shorelines and in open water in sanctuary. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Surf scoter	<i>Melanitta perspicillata</i>	Non-BCC Vulnerable	Breeds elsewhere	- May be found on shorelines and in open water in sanctuary. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Swallow-tailed kite	<i>Elanoides forficatus</i>	BCC Rangewide (CON)	Breeds Mar 10 to Jun 30	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce	Occasionally	Resting, foraging

				disturbance; minimal disturbance from management activities.		
Whimbrel	<i>Numenius phaeopus</i>	BCC Rangewide (CON)	Breeds elsewhere	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
White-crowned pigeon	<i>Patagioenas leucocephala</i>	BCC Rangewide (CON)	Breeds May 1 to Sep 30	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Frequently	Resting, foraging, breeding
Willet	<i>Tringa semipalmata</i>	BCC Rangewide (CON)	Breeds Apr 20 to Aug 5	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Wilson's plover	<i>Charadrius wilsonia</i>	BCC Rangewide (CON)	Breeds Apr 1 to Aug 20	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging
Wilson's storm-petrel	<i>Oceanites oceanicus</i>	Non-BCC Vulnerable	Breeds elsewhere	- May be found in and over open water in sanctuary. - Minimal disturbance from management activities.	Occasionally	Resting, foraging
Yellow warbler	<i>Dendroica petechia gundlachi</i>	BCC - BCR	Breeds May 20 to Aug 10	- May be found on shorelines and may occur in transit over open water between coastal islands. - Actions would be mostly beneficial to reduce disturbance; minimal disturbance from management activities.	Occasionally	Resting, foraging

NMFS listed species

Threatened, endangered, and imperiled species

<https://www.fisheries.noaa.gov/southeast/consultations/florida-atlantic-coast>

<https://www.fisheries.noaa.gov/southeast/consultations/florida-gulf-coast>

Type	Common name	Species	Status	Life history and habitat requirements	Potential Effects	Conclusion
Marine mammal species	Blue whale	<i>Balaenoptera musculus</i>	Endangered	May be found transiting and foraging in open water.	- Actions would be mostly beneficial to reduce disturbance from commercial activities and to protect water quality; minimal disturbance and risk of adverse impacts from vessel strikes from management activities.	May affect, not likely to adversely affect
	Fin whale	<i>Balaenoptera physalus</i>	Endangered	May be found transiting and foraging in open water.	- Actions would be mostly beneficial to reduce disturbance from commercial activities and to protect water quality; minimal disturbance and risk of adverse impacts from vessel strikes from management activities.	May affect, not likely to adversely affect
	North Atlantic right whale	<i>Eubalaena glacialis</i>	Endangered	May be found transiting and foraging in open water.	- Actions would be mostly beneficial to reduce disturbance from commercial activities and to protect water quality; minimal disturbance and risk of adverse impacts from vessel strikes from management activities.	May affect, not likely to adversely affect
	Sei whale	<i>Balaenoptera borealis</i>	Endangered	May be found transiting and foraging in open water.	- Actions would be mostly beneficial to reduce disturbance from commercial activities and to protect water quality; minimal disturbance and risk of adverse impacts from vessel strikes from management activities.	May affect, not likely to adversely affect
	Sperm whale	<i>Physeter macrocephalus</i>	Endangered	May be found transiting and foraging in open water.	- Actions would be mostly beneficial to reduce disturbance from commercial activities and to protect water quality; minimal disturbance and risk of adverse impacts from vessel strikes from management activities.	May affect, not likely to adversely affect

	Bryde's whale	<i>Balaenoptera edeni</i>	Endangered	May be found transiting and foraging in open water.	- Actions would be mostly beneficial to reduce disturbance from commercial activities and to protect water quality; minimal disturbance and risk of adverse impacts from vessel strikes from management activities.	Actions would be mostly beneficial to reduce disturbance from commercial activities and to protect water quality; minimal disturbance and risk of adverse impacts from vessel strikes from management activities.
Sea turtle species	Green sea turtle	<i>Chelonia mydas</i>	Threatened	May be found on beaches nesting or hatching or transiting and foraging in open water.	- Actions would be mostly beneficial to reduce negative effects from commercial activities and disturbance of nesting beaches; minimal disturbance from management activities. - Management activities by vessel would be conducted to reduce strikes.	May affect, not likely to adversely affect
	Hawksbill sea turtle	<i>Eretmochelys imbricata</i>	Endangered	May be found on beaches nesting or hatching or transiting and foraging in open water.	- Actions would be mostly beneficial to reduce negative effects from commercial activities and disturbance of nesting beaches; minimal disturbance from management activities. - Management activities by vessel would be conducted to reduce strikes.	May affect, not likely to adversely affect
	Kemp's ridley sea turtle	<i>Lepidochelys kempii</i>	Endangered	May be found on beaches nesting or hatching or transiting and foraging in open water.	- Actions would be mostly beneficial to reduce negative effects from commercial activities and disturbance of nesting beaches; minimal disturbance from management activities.	May affect, not likely to adversely affect

					- Management activities by vessel would be conducted to reduce strikes.	
	Leatherback sea turtle	<i>Dermochelys coriacea</i>	Endangered	May be found on beaches nesting or hatching or transiting and foraging in open water.	- Actions would be mostly beneficial to reduce negative effects from commercial activities and disturbance of nesting beaches; minimal disturbance from management activities. - Management activities by vessel would be conducted to reduce strikes.	May affect, not likely to adversely affect
	Loggerhead sea turtle	<i>Caretta caretta</i>	Threatened	May be found on beaches nesting or hatching or transiting and foraging in open water. FKNMS contains critical habitat for this species.	- Actions would be mostly beneficial to reduce negative effects from commercial activities and disturbance of nesting beaches; minimal disturbance from management activities. - Management activities by vessel would be conducted to reduce strikes.	May affect, not likely to adversely affect
Fish species	Gulf sturgeon	<i>Acipenser oxyrinchus desotoi</i>	Endangered	This species is known or believed to occur in Monroe County but there is limited estuarine habitat for juveniles or spawning adults in FKNMS.	- FKNMS actions would be mostly beneficial to reduce disturbance. There would be minimal disturbance from management activities. - Management activities by vessel would be conducted to reduce strikes.	May affect, not likely to adversely affect
	Shortnose sturgeon	<i>Acipenser brevirostrum</i>	Endangered	This species is commonly found in rivers and estuaries of the East Coast but is uncommon in South Florida.	- FKNMS actions would not affect this species.	No effect
	Atlantic sturgeon	<i>Acipenser oxyrinchus oxyrinchus</i>	Endangered	This species is commonly found in rivers and estuaries of the East Coast but is uncommon in South Florida.	- FKNMS actions would not affect this species.	No effect
	Smalltooth sawfish	<i>Pristis pectinata</i>	Endangered	May be found in nearshore mangrove and seagrass habitats. FKNMS contains	- FKNMS actions would be mostly beneficial to reduce disturbance. There would be minimal disturbance from management activities.	May affect, not likely to adversely affect

				critical habitat for this species.	- Management activities by vessel would be conducted to reduce strikes.	
	Nassau grouper	<i>Epinephelus striatus</i>	Threatened	May be found in coral reef and seagrass habitats.	- FKNMS actions would be mostly beneficial to protect habitat and water quality. - There would be minimal disturbance from management activities.	May affect, not likely to adversely affect
	Oceanic whitetip shark	<i>Carcharhinus longimanus</i>	Threatened	May be found transiting and foraging in open water.	- Actions would be mostly beneficial to reduce disturbance from commercial activities and to protect water quality; minimal disturbance and risk of adverse impacts from vessel strikes from management activities.	May affect, not likely to adversely affect
	Giant manta ray	<i>Manta birostris</i>	Threatened	May be found transiting and foraging in open water.	- Actions would be mostly beneficial to reduce disturbance from commercial activities and to protect water quality; minimal disturbance and risk of adverse impacts from vessel strikes from management activities.	May affect, not likely to adversely affect
Invertebrate species	Pillar coral	<i>Dendrogyra cylindrus</i>	Threatened	This species may be found on reef and hardbottom habitats within FKNMS, mostly on the Atlantic side of the Florida Keys in proximity to the warm, low nutrient waters of the Florida Current.	- FKNMS actions would be mostly beneficial to protect habitat and water quality. - There would be minimal disturbance from management activities.	May affect, not likely to adversely affect
	Rough cactus coral	<i>Mycetophyllia ferox</i>	Threatened	This species may be found on reef and hardbottom habitats within FKNMS, mostly on the Atlantic side of the Florida Keys in proximity to the warm, low nutrient waters of the Florida Current.	- FKNMS actions would be mostly beneficial to protect habitat and water quality. - There would be minimal disturbance from management activities.	May affect, not likely to adversely affect
	Lobed star coral	<i>Orbicella annularis</i>	Threatened	This species may be found on reef and hardbottom habitats within FKNMS,	- FKNMS actions would be mostly beneficial to protect habitat and water quality.	May affect, not likely to adversely affect

				mostly on the Atlantic side of the Florida Keys in proximity to the warm, low nutrient waters of the Florida Current.	- There would be minimal disturbance from management activities.	
	Mountainous star coral	<i>Orbicella faveolata</i>	Threatened	This species may be found on reef and hardbottom habitats within FKNMS, mostly on the Atlantic side of the Florida Keys in proximity to the warm, low nutrient waters of the Florida Current.	- FKNMS actions would be mostly beneficial to protect habitat and water quality. - There would be minimal disturbance from management activities.	May affect, not likely to adversely affect
	Boulder star coral	<i>Orbicella franksi</i>	Threatened	This species may be found on reef and hardbottom habitats within FKNMS, mostly on the Atlantic side of the Florida Keys in proximity to the warm, low nutrient waters of the Florida Current.	- FKNMS actions would be mostly beneficial to protect habitat and water quality. - There would be minimal disturbance from management activities.	May affect, not likely to adversely affect
	Elkhorn coral	<i>Acropora palmata</i>	Threatened	This species may be found on reef and hardbottom habitats within FKNMS, mostly on the Atlantic side of the Florida Keys in proximity to the warm, low nutrient waters of the Florida Current. FKNMS contains designated critical habitat for this species.	- FKNMS actions would be mostly beneficial to protect habitat and water quality. - There would be minimal disturbance from management activities.	May affect, not likely to adversely affect
	Staghorn coral	<i>Acropora cervicornis</i>	Threatened	This species may be found on reef and hardbottom habitats within FKNMS, mostly on the Atlantic side of the Florida Keys in proximity to the warm, low nutrient waters of the Florida Current. FKNMS	- FKNMS actions would be mostly beneficial to protect habitat and water quality. - There would be minimal disturbance from management activities.	May affect, not likely to adversely affect

				contains designated critical habitat for this species.		
Seagrass species	Johnson's seagrass	<i>Halophila johnsonii</i>	Threatened	This seagrass is found in coarse sand and muddy substrates with designated critical habitat in Biscayne Bay near but not within FKNMS.	- FKNMS actions would not affect this species.	No effect

For more information on listed species please visit: <http://www.nmfs.noaa.gov/pr/species/esa/listed.htm>
http://sero.nmfs.noaa.gov/protected_resources/index.html

Critical habitat and Essential Fish Habitat

https://sero.nmfs.noaa.gov/maps_gis_data/protected_resources/critical_habitat/index.html

Type	Common name	Species	Status	Life history and habitat requirements	Potential Effects	Conclusion
Critical Habitat	Loggerhead sea turtle	<i>Caretta caretta</i>	Designated critical habitat	Ten reproductive habitat areas on beaches in the Dry Tortugas and lower and middle Keys; one open water breeding and migratory area on the Atlantic side of the Keys from Key West NWR to north of Jupiter Inlet; one open water sargassum habitat area on the Atlantic side of FKNMS and Pulley Ridge.	FKNMS actions would be mostly beneficial to protect habitat and water quality. There would be minimal disturbance from management activities.	May affect, not likely to adversely affect
	Elkhorn and Staghorn corals	<i>Acropora palmata</i> <i>Acropora cervicornis</i>	Designated critical habitat	One area in the Dry Tortugas; two areas on the Atlantic side of the Keys: one from Key West NWR to Dania Beach and one from Port Everglades to Boynton Inlet	FKNMS actions would be mostly beneficial to protect habitat and water quality. There would be minimal disturbance from management activities.	May affect, not likely to adversely affect
	Johnson's seagrass	<i>Halophila johnsonii</i>	Designated critical habitat	One area in Biscayne Bay near but not within FKNMS from Florida 826 south to just north of FL 913 on the Florida mainland east to Virginia Key	FKNMS actions would not affect this species.	No effect
	Smalltooth sawfish	<i>Pristis pectinata</i>	Designated critical habitat	One area in Florida Bay from Blackwater Sound to Long Key	FKNMS actions would be mostly beneficial to protect habitat and water quality. There would be minimal disturbance from management activities.	May affect, not likely to adversely affect

Essential Fish Habitat

AHMS: Atlantic Highly Migratory Species

GMFMC: Gulf of Mexico Fishery Management Council

SAFMC: South Atlantic Fishery Management Council

MAFMC: Mid-Atlantic Fishery Management Council

Species: Common name	Lifestage	Region
Atlantic sharpnose shark (Gulf of Mexico stock)	Juvenile/Adult	AHMS
Atlantic sharpnose shark (Gulf of Mexico stock)	ALL	AHMS
Bigeye thresher shark	ALL	AHMS
Bigeye tuna	ALL	AHMS
Bigeye tuna	Juvenile	AHMS
Blacknose shark (Gulf of Mexico stock)	ALL	AHMS
Blacknose shark (Gulf of Mexico stock)	Juvenile/Adult	AHMS
Blacknose shark (Gulf of Mexico stock)	Neonate	AHMS
Blacktip shark (Atlantic stock)	Juvenile/Adult	AHMS
Blacktip shark (Atlantic stock)	ALL	AHMS
Blacktip shark (Gulf of Mexico stock)	Juvenile/Adult	AHMS
Blacktip shark (Gulf of Mexico stock)	Neonate	AHMS
Blacktip shark (Gulf of Mexico stock)	ALL	AHMS
Blue marlin	Adult	AHMS
Blue marlin	ALL	AHMS
Blue marlin	Spawning adults	AHMS
Blue marlin	Juvenile	AHMS
Bluefin tuna	ALL	AHMS

Bluefin tuna	Spawning adults, eggs, larvae	AHMS
Bluefish	Juvenile	MAFMC
Bluefish	Eggs	MAFMC
Bluefish	Adult	MAFMC
Bluefish	ALL	MAFMC
Bluefish	Larvae	MAFMC
Bonnethead shark (Gulf of Mexico stock)	Juvenile	AHMS
Bonnethead shark (Gulf of Mexico stock)	ALL	AHMS
Bonnethead shark (Gulf of Mexico stock)	Adult	AHMS
Bonnethead shark (Gulf of Mexico stock)	Neonate	AHMS
Bull shark	Juvenile/Adult	AHMS
Bull shark	ALL	AHMS
Bull shark	Neonate	AHMS
Caribbean reef shark	ALL	AHMS
Coastal migratory pelagics	ALL	SAFMC
Coastal migratory pelagics	ALL	GMFMC
Corals	ALL	SAFMC
Corals	ALL	GMFMC
Great hammerhead shark	ALL	AHMS
Lemon shark	Adult	AHMS
Lemon shark	ALL	AHMS
Lemon shark	Juvenile	AHMS
Lemon shark	Neonate	AHMS

Appendix E: FKNMS listed species

Longbill spearfish	ALL	AHMS
Longfin mako shark	ALL	AHMS
Night shark	ALL	AHMS
ALL	ALL	AHMS
AHMS	ALL	AHMS
Nurse shark	Juvenile/Adult	AHMS
Nurse shark	ALL	AHMS
Red drum	ALL	GMFMC
Reef fish	ALL	GMFMC
Sailfish	Juvenile	AHMS
Sailfish	ALL	AHMS
Sailfish	Spawning adults, eggs, larvae	AHMS
Sailfish	Adult	AHMS
Sandbar shark	ALL	AHMS
Sandbar shark	Adult	AHMS
Scalloped hammerhead shark	ALL	AHMS
Scalloped hammerhead shark	Juvenile/Adult	AHMS
Shortfin mako shark	ALL	AHMS
Shrimp	ALL	GMFMC
Silky shark	ALL	AHMS
Skipjack tuna	Juvenile	AHMS
Skipjack tuna	ALL	AHMS
Skipjack tuna	Spawning adults, eggs, larvae	AHMS

Skipjack tuna	Adult	AHMS
Smoothhound shark complex (Gulf of Mexico stock)	ALL	AHMS
Snapper grouper	ALL	SAFMC
Spinner shark	Neonate	AHMS
Spinner shark	ALL	AHMS
Spiny lobster	ALL	SAFMC
Spiny lobster	ALL	GMFMC
Swordfish	ALL	AHMS
Swordfish	Adult	AHMS
Swordfish	Spawning adults, eggs, larvae	AHMS
Swordfish	Juvenile	AHMS
Tiger shark	ALL	AHMS
Tiger shark	Juvenile/Adult	AHMS
Tiger shark	Neonate	AHMS
Whale shark	ALL	AHMS
White marlin	ALL	AHMS
White marlin	Adult	AHMS
White marlin	Juvenile	AHMS
Yellowfin tuna	ALL	AHMS
Yellowfin tuna	Spawning adults, eggs, larvae	AHMS

State of Florida species

Type	Common name	Species	Status	Range	Occurrence
Fish	Blackmouth shiner	<i>Notropis melanostomus</i>	State-designated Threatened	Yellow, Shoal, and Blackwater River, and Pond Creek	Not expected to occur in FKNMS
	Bluenose shiner	<i>Pteronotropis welaka</i>	State-designated Threatened	St. Johns River basin and the western panhandle	Not expected to occur in FKNMS
	Crystal darter	<i>Crystallaria asprella</i>	State-designated Threatened	Inhabits rivers with modest current, sandy riffles, and a sand/gravel bottom of medium to large size streams (Escambia River)	Not expected to occur in FKNMS
	Key silverside	<i>Menidia conchorum</i>	State-designated Threatened	Inhabits protected saline lagoons and ponds with restricted tidal exchange - endemic to the lower and middle Keys, documented in lagoons on Long, Grassy, Big Pine, No Name, Little Torch, Cudjoe, Sugarloaf, Saddle Bunch, and Rockland keys; Boca Chica, and Key West.	
	Saltmarsh topminnow	<i>Fundulus jenkinsi</i>	State-designated Threatened	Extreme western portion of the Florida panhandle	Not expected to occur in FKNMS
	Southern tessellated darter	<i>Etheostoma olmstedi maculatiiceps</i>	State-designated Threatened	St. Johns River	Not expected to occur in FKNMS
Amphibians	Florida bog frog	<i>Lithobates okaloosae</i>	State-designated Threatened	Walton, Okaloosa, and Santa Rosa counties	Not expected to occur in FKNMS
	Georgia blind salamander	<i>Eurycea wallacei</i>	State-designated Threatened	Jackson, Washington, and Calhoun counties	Not expected to occur in FKNMS
Reptiles	Barbour's map turtle	<i>Graptemys barbouri</i>	State-designated Threatened	Aucilla, Ochlockonee, Apalachicola, Chipola, and Choctawhatchee rivers	Not expected to occur in FKNMS
	Florida brown snake	<i>Storeria victa</i>	State-designated Threatened	Only the Lower Keys population is state-designated Threatened - inhabit hardwood hammocks in the Lower Keys on Big Pine, Little Torch, Middle Torch, No Name, and Sugarloaf keys.	
	Florida Keys mole skink	<i>Plestiodon egregius egregius</i>	State-designated Threatened	Inhabits sandy areas under rocks, leaf litter, and tidal wracks (line of washed up vegetation on the beach that consists of dead seaweed and marsh grass). This species can be found in the Florida Keys in Dry Tortugas, Key West, Stock Island,	

				Middle Torch Key, Big Pine Key, Key Vaca, Grassy Key, Upper Matecumbe Key, Indian Key, and Key Largo.	
	Florida pine snake	<i>Pituophis melanoleucus mugitus</i>	State-designated Threatened	Inhabits dry upland habitats with well-drained sandy soils. They use burrows of other animals, most notably those of pocket gophers.	Not expected to occur in FKNMS
	Gopher tortoise	<i>Gopherus polyphemus</i>	State-designated Threatened	Prefer well-drained, sandy soils found in habitats such as longleaf pine sandhills, xeric oak hammocks, scrub, pine flatwoods, dry prairies, and coastal dunes	
	Key ringneck snake	<i>Diadophis punctatus acricus</i>	State-designated Threatened	Inhabits tropical hardwood hammocks and scrub. This species is restricted to the Lower Keys and has been found on Key West and Big Pine, Little Torch, Middle Torch, and No Name keys.	
	Rim rock crowned snake	<i>Tantilla oolitica</i>	State-designated Threatened	Inhabits pine rockland and tropical hardwood hammocks near fresh water. They can be found in holes and depressions in the oolitic limestone, but they can also be found periodically in rotten logs, under rocks and trash - various localities in Miami - also occurs in the Upper, Middle, and Lower keys.	
	Short-tailed snake	<i>Lampropeltis extenuate</i>	State-designated Threatened	In sandy soils, particularly longleaf pine and xeric oak sandhills, scrub, and xeric hammock habitats - only from the Suwannee River south to Highlands County	Not expected to occur in FKNMS
	Suwannee alligator snapping turtle	<i>Marcochelys suwanniensis</i>	State-designated Threatened	Can be found in the Panhandle and Big Bend regions, from the Escambia River east to the Suwannee River	Not expected to occur in FKNMS
Birds	American oystercatcher	<i>Haematopus palliatus</i>	State-designated Threatened	Inhabits beaches, sandbars, spoil islands, shell rakes, salt marsh, and oyster reefs	
	Black skimmer	<i>Rynchops niger</i>	State-designated Threatened	Inhabits coastal areas in Florida such as estuaries, beaches, and sandbars	
	Florida burrowing owl	<i>Athene cunicularia floridana</i>	State-designated Threatened	Inhabits open prairies in Florida that have very little understory vegetation	
	Florida sandhill crane	<i>Antigone canadensis pratensis</i>	State-designated Threatened	Inhabits freshwater marshes, prairies, and pastures	Not expected to occur in FKNMS

	Least tern	<i>Sternula antillarum</i>	State-designated Threatened	Inhabits estuaries and bays	
	Little blue heron	<i>Egretta caerulea</i>	State-designated Threatened	Inhabits fresh, salt, and brackish water environments - including swamps, estuaries, ponds, lakes, and rivers	
	Marian's marsh wren	<i>Cistothorus palustris marianae</i>	State-designated Threatened	Inhabits marshes dominated by black needle rush (<i>Juncus roemarianus</i>) and cordgrass (<i>Spartina alterniflora</i>) from Pasco to Escambia County	Not expected to occur in FKNMS
	Reddish egret	<i>Egretta rufescens</i>	State-designated Threatened	Inhabits estuaries near mangroves and lagoons	
	Roseate spoonbill	<i>Platalea ajaja</i>	State-designated Threatened	Florida Bay	
	Scott's seaside sparrow	<i>Ammodramus maritimus peninsulae</i>	State-designated Threatened	Inhabits tidal marshes in Florida. Scott's seaside sparrow can be found from Pasco County to Pepperfish Keys in Dixie County.	Not expected to occur in FKNMS
	Snowy plover	<i>Charadrius nivosus</i>	State-designated Threatened	Inhabits sandy beaches	
	Southeastern American kestrel	<i>Falco sparverius paulus</i>	State-designated Threatened	Found in open pine savannahs, sandhills, prairies, and pastures	
	Tricolored heron	<i>Egretta tricolor</i>	State-designated Threatened	Inhabits fresh and saltwater marshes, estuaries, mangrove swamps, lagoons, and river deltas	
	Wakulla seaside sparrow	<i>Ammodramus maritimus juncicola</i>	State-designated Threatened	Can be found in tidal marshes from Taylor County to St. Andrews Bay	Not expected to occur in FKNMS
	White-crowned pigeon	<i>Patagioenas leucocephala</i>	State-designated Threatened	Inhabits low-lying forest habitats with ample fruiting trees - Florida Bay, Biscayne Bay, and Keys	
	Worthington's marsh wren	<i>Cistothorus palustris griseus</i>	State-designated Threatened	Inhabit tidal marshes dominated by cordgrass (<i>Spartina alterniflora</i>) and are found from the St. Mary's/Cumberland Island Sound, to the northern edge of the St. Johns River	Not expected to occur in FKNMS
Mammals	Big Cypress fox squirrel	<i>Sciurus niger avicennia</i>	State-designated Threatened	Found in open woods, pine and cypress stands, and mangrove swamps in Lee county to the southern part of Dade	
	Everglades mink	<i>Neovison vison evergladensis</i>	State-designated Threatened	Can be found in both fresh and salt water marsh habitats in the Everglades and Big Cypress	

	Sanibel Island rice rat	<i>Oryzomys palustris sanibeli</i>	State-designated Threatened	Can be found in coastal marshes, hydric hammocks, swamps, and freshwater marshes and meadows - only on Sanibel Island	Not expected to occur in FKNMS
	Sherman's short-tailed shrew	<i>Blarina shermani</i>	State-designated Threatened	Inhabits dense, herbaceous habitats and moist forests, including mixed wetland forests, mixed hardwood-pine forests, ditches, and disturbed/transitional habitat - Collier and Lee counties	Not expected to occur in FKNMS
Crustaceans	Black Creek crayfish	<i>Procambarus pictus</i>	State-designated Threatened	Inhabits tannic stained streams where they can be found taking refuge under tree roots and in vegetation - in St. Johns, Duval, Clay, and Putnam counties	Not expected to occur in FKNMS
	Panama City crayfish	<i>Procambarus econfinae</i>	State-designated Threatened	In wet flatwoods habitat in the Panama City area	Not expected to occur in FKNMS
	Santa Fe cave crayfish	<i>Procambarus erythrops</i>	State-designated Threatened	Inhabits groundwater areas in caves and sinkholes in southern Suwannee and southwestern Columbia counties	Not expected to occur in FKNMS

APPENDIX F

MILITARY ACTIVITIES

Introduction

This appendix provides a description of Department of Defense/U.S. Navy activities in and around Florida Keys National Marine Sanctuary (FKNMS). Inclusion of this appendix does not convey de facto exemption for these activities under FKNMS regulations. Any activities listed that are different than those identified in the original 1997 FKNMS Final EIS would not be exempt. NOAA is working with the Navy to determine which activities have been traditionally conducted in the Florida Keys and sanctuary since FKNMS designation. Any new activities not considered in the original 1997 FKNMS Final EIS or activities whose nature and scope have been modified would trigger NMSA section 304(d) consultation.



DEPARTMENT OF THE NAVY

NAVAL AIR STATION
PO BOX 9001
KEY WEST FL 33040-9001

5090
Ser PR74/ 308
3 Jul 14

Mr. Sean Morton
Sanctuary Superintendent
Florida Keys National Marine Sanctuary
33 East Quay Road
Key West, FL 33040


Dear Superintendent Morton:

Please accept enclosure (1) as our input for your Draft Environmental Impact Statement (DEIS) on Revisions of Boundaries, Regulations and Zoning Scheme for the Florida Keys National Marine Sanctuary (FKNMS) and Revisions of Fish and Wildlife Service (FWS) and State of Florida Management Agreement for Submerged Lands within Boundaries of the Key West and Great White Heron National Wildlife Refuges and Regulations.

Naval Air Station (NAS) Key West looks forward to further discussions with you and the FWS during this process to ensure the Navy's capability to adequately support mission essential military training and operations are maintained within the FKNMS and the Wildlife Refuges of the Florida Keys.

NAS Key West is committed to environmental stewardship and we look forward to working with you to minimize our impact on natural resources. My point of contact is my Environmental Director, Mr. Edward Barham. He can be reached at COMM: (305) 293-2911 or via e-mail: edward.barham@navy.mil.

Sincerely,


S. P. MCALEARNEY
Captain, U.S. Navy
Commanding Officer

Enclosure: 1. NAS Key West Military Activities Description For FKNMS/FWS DEIS

Department of Defense Activities

The U.S. Department of Defense has played an important role in Monroe County since the early 1800s, when the Federal government established a small Naval operation in Key West to control piracy in nearby waters.

The Department of the Defense (DOD) currently maintains several sites in the Florida Keys, including the largest unencumbered airspace available for training on the East Coast. Although all of the military DOD Services (Navy, Marine Corp., Air Force and Army) are represented in the region, the Navy's presence is the most significant.

Naval Air Station Key West

The Navy's presence in Key West dates back to 1822 with a Naval base established in 1823 to stop piracy in the area. This base was expanded during the Mexican War (1845-1848) and the Spanish-American War (1898) when the battleship *Maine* sailed from Key West to Havana, Cuba, where it experienced an explosion and sank in Havana harbor. The sinking of the *Maine* precipitated the United States declaration of war on Spain; the entire U.S. Atlantic Fleet moved to Key West for the duration of the war.

During World War I (1914-1918), Naval facilities in Key West were enlarged (to include piers, barracks, communication facilities, submarine basin, and other buildings) as Key West served as a strategic defense center to shipping lanes throughout the war. When the United States entered the war in 1917, a Naval Air Station (NAS) was constructed near the northwest end of Key West, in an area now known as Trumbo Point; the seaplane base consisted of a seaplane training center, a dirigible hangar, barracks, and administration buildings.

NAS Key West was established at its present location on Boca Chica Key during World War II (1941-1945). Boca Chica Field originated as a civilian airfield. It was leased to the Army in 1942 when three paved runways were built and was transferred to the Navy in December 1942. During the war, the Air Station was used to train carrier pilots and housed 4,000 personnel; nearby Saddlebunch Key was used as a practice bombing range. During the Cuban missile crisis (1962), operational and reconnaissance flights were flown from the Air Station in support of the Naval quarantine around Cuba. After the Cuban missile crisis, permanent missile sites were constructed at various locations around the Air Station and alert aircraft were maintained at the airfield. Although much of the military presence in the Lower Keys was disestablished in March 1979, a decision was made to keep NAS Key West as a fully operational Naval Air Station. Airfield operations at NAS Key West in the late 1970s were estimated at 85,000 per year, with approximately 400 airfield operations per day estimated on a busy day. Since then, NAS Key West has been training location for many types of DOD aircraft and a variety of airfield training operations have been conducted at the airfield, including touch and goes, Field Carrier Landing Practice (FCLPs), and other pattern operations. As with other Navy airfields, the volume of annual airfield operations at NAS Key West fluctuates from year-to-year based on factors such as training needs, national defense missions, relief/humanitarian efforts, surge requirements and airfield construction/repair projects.

Throughout the decades, the southernmost Naval Air Station in the continental U.S. has proven to be an ideal year-round training facility with rapid access to unencumbered offshore training areas and overlying airspace. NAS Key West has been a home base to various squadrons and squadron detachments flying antisubmarine warfare, tactical electronic warfare, reconnaissance, attack, combat adversary, and strike

fighter aircraft. Most recently, in January 2006, Fighter Squadron Composite (VFC) - 111 was home based at NAS Key West. Military units have routinely used detachments at NAS Key West for aviation training at the airfield and offshore range complex and the Air Station has served important roles in support of operations in South America and for disaster assistance and other world events.

These roles continue at NAS Key West. Currently, the Air Station employs approximately 3,000 military, DoD civilian and contractor personnel, is home base to 20 aircraft, and can support up to approximately 80 visiting aircraft and 1,200 visiting personnel at one time, as well as provide port operations for home ported and visiting ships.

NAS Key West comprises 6,389 acres of land distributed in numerous properties located in the Florida Keys. Most of NAS Key West lies in the vicinity of Boca Chica which encompasses 3,912 acres and consists of an airfield, administrative and industrial facilities, and recreational areas. NAS Key West also provides and maintains facilities and services for other Navy tenants as well as other Department of Defense (DOD) Services and the United States Coast Guard (USCG).

Trumbo Point Annex includes helicopter landing area, large multi-use hangar, visitors quarters, fuel tank farm, vacation rentals, and family housing. A Naval Air Warfare Detachment (NAWCAD Det) Atlantic Targets & Marine Operations (ATMO) is also located at Trumbo Point. The NAWCAD Det conducts research projects involving sonobuoys, lasers, navigational systems, ordnance and various other research.

Fleming Key, accessible by a bridge from Trumbo Annex, is the site of the U.S. Army Special Forces Underwater Operations School (USASFUOS), a munitions magazine area and a closed U.S. Department of Agriculture, Animal & Plant Health Inspection Service (APHIS) Quarantine Station. The Army school trains combat divers, dive supervisors, and dive medical technicians.

Truman Annex consists of multi-use buildings on about 80 acres of land, plus a 50-acre harbor separated from open water by a 7.6-acre Mole Pier. Truman Annex is home to Joint Interagency Task Force South (JIATFS) and its mission as the lead interagency command responsible for the detection and interdiction of illicit drug trafficking. The annex supports U.S. Navy and allied nation war ships with berthing, freshwater, and occasionally fuel and other support services. In addition, by agreement with the City of Key West, Truman Annex also serves to berth cruise ships. Truman Annex also houses Department of Commerce Florida Keys National Marine Sanctuary (FKNMS), and National Oceanic and Atmospheric Administration (NOAA) assets are located on land excessed as a result of Defense Base Closure and Realignment (BRAC) 95.

NAS Key West Range Complex

The Key West Range Complex lies between the Florida mainland and Cuba, an area that has a mild climate, and a high percentage of visual flight rules (VFR) conditions which is ideal for Navy training. The location is of particular importance because of its supporting infrastructure and unobstructed airspace with favorable weather that allows for all levels of training and the efficient use of resources.

Training must be as realistic as possible to provide the initial experience and confidence necessary to ensure success and survival in combat. The Navy often employs simulators and synthetic training to provide early skill repetition and to enhance teamwork, but live training in a realistic environment is vital to success. A range complex, such as the Key West Range Complex, is a set of co-located or nearly

collocated areas, which may include sea space, subsurface space, land ranges, and overlying airspace designated for military training and testing operations (see Figure 1- 1).

The Key West Range Complex consists of the following components:

- Offshore operating area (OPAREA) (surface and subsurface waters);
- Offshore special use airspace (SUA) divided into warning areas; and
- A submerged surface target (Patricia Target) and a visual landmark land area (Demolition Key).

Together these components encompass 25,000 square miles of special use airspace (SUA) and 8,288 nm² of ocean within the NAS Key West area of responsibility (AOR) . The Key West OPAREA is located south of Key West, Florida within the Straits of Florida between the United States and Cuba. The undersea space includes depths that range from shallower than 17 fathoms (100 feet) in near shore areas, to over 1,830 fathoms (11,000 feet) in offshore areas.

Range complexes provide a controlled and safe environment with threat-representative targets where military ships and aircraft can train in realistic, combat-like conditions throughout the graduated buildup needed for combat ready deployment. The integration of subsurface ranges and OPAREAS with land training ranges, safe landing fields, and amphibious landing sites are critical to this realism, allowing execution of multidimensional exercises in complex scenarios. Also, range instrumentation captures data on the effectiveness of tactics and equipment and provides feedback for constructive critiques. Live-fire training ensures the ability to place ordnance on target with the required level of precision in a stressful environment. Live training, most of it accomplished in the waters off the nation’s east and west coasts and the Caribbean Sea, will remain the cornerstone of readiness as the Navy transforms its military forces for a security environment characterized by uncertainty and surprise.

The mission of the Key West Range Complex isto provide sustainable and modernized ocean operating areas, airspace, ranges, range infrastructure, training facilities, and resources to fully support Navy training requirements. The Key West Range Complex also provides critical support for Navy operational readiness training.

Training at the Key West Range Complex historically has been diverse, including ship and aircraft maneuvers, gunnery and bombing exercises, and joint training exercises. Numerous commands and their subordinate units across multiple Naval warfare areas use the Key West Range Complex. Now, and in the foreseeable future, the typical range users include Navy fighter squadrons and aggressor squadron aircraft. Less frequent users include other DoD and Federal entities. The primary operation conducted in the Key West Range Complex is Air Warfare (AW), specifically, Air Combat Maneuvers (ACM).

The Tortugas Military Operating Area

The Tortugas Military Operating Area (MOA) is a unique block of special use airspace (SUA) located above the Dry Tortugas National Park. The Tortugas MOA extends from 5,000 feet mean sea level (MSL) to 18,000 feet MSL (FL180). Air combat maneuvers (ACM) training occurs regularly in the SUA above and beside the MOA. Tactical maneuvers resulting in supersonic flight are not conducted in the Tortugas MOA above Fort Jefferson and Dry Tortugas National Park between 5,000 feet and 18,000 feet. No chaff or flare exercises occur within the MOA. The MOA is that airspace within an area bounded by a line 12 NM from and parallel to the shoreline of the Dry Tortugas Islands.

Economic Significance

NAS Key West contributes \$636 million annually into the local economy. The on-site military, civilian, and contractor employment population at NAS Key West is approximately 820 personnel. In addition to NAS Key West personnel, approximately 2,219 persons are employed by NAS Key West tenants. Including dependents, the military population makes up approximately 5,500 people. As such, the Department of Defense (DOD) needs to ensure the continued capability of NAS Key West to support mission requirements while promoting the compatible growth and development of the surrounding community.

The Navy spends approximately \$38 million annually to operate and maintain Air Station facilities. Additional spending occurs on a case by case basis for military construction projects and tenant activity spending. In recent years, spending for major military construction has included projects for harbor maintenance dredging, airfield lighting, restoration of clear zones and drainage at Boca Chica Field, and utility privatization. A \$15.7 million fire station project also is planned for the Air Station in 2014.

Additional socioeconomic benefit is realized from mutual aid agreements for law enforcement, fire, and emergency services; continuing education support; environmental stewardship; and large scale contingency capabilities such as hurricane recovery.

Current Department of Defense Activities

Existing classes of DoD military activities conducted prior to the effective date of sanctuary regulations and identified in the 1996 Final Management Plan/Environmental Impact Statement for the Florida Keys National Sanctuary (National Marine Sanctuary Program 1996) included:

- Research on radar and missile systems and test missile operations and evaluation
- Underwater explosives testing (including weapon systems testing and shock testing of ship hull designs) in “Site A”
- Mine countermeasure research
- Corrosion and coatings tests
- Acoustic research
- General air operations
- Air combat maneuvering
- Air-to-surface ordnance (inert ordnance and smoke markers) at Patricia Range
- Submarine activities (including firing and recovery of non-explosive torpedoes outside sanctuary)
- Sonobuoy testing and diver training (typically includes recovery of sonobuoys)
- Special warfare activities at Fleming Key
- Search and rescue
- General transits, anchoring in designated areas, moorings, and pierside maintenance at Naval Air Station Key West piers
- Harbor management
- Fuel deliveries

Research and Development

DOD conducts research and development activities in the Florida Keys, both on and offshore, including research on radar and missile systems and test missile operations and evaluation. Other Research, Testing, Development and Evaluation (RTD&E) activities include the following:

- Underwater Explosives Testing. The Navy formerly conducted small explosives testing in the shallow waters (12 to 120 m) of the Keys. The Navy now tests explosives in an area Site A/E-1 (Site A). Geographically, Site A/E-1 is in the central Florida Straits just to the north of the Gulf Stream axis with coordinates of 23° 55' N to 24° 15' N between 81° 49' W and 82° 15' W as shown in Key West Offshore Detonation Areas figure. The upper boundary of which is located 18 miles southwest of Key West and about 10 miles from the current Sanctuary boundary.

Many of these tests are in connection with weapon systems testing or the shock testing of ship hull designs.

Two additional test sites, Sites D & H were identified and used in the 1990's (see Key West Offshore Detonation Areas figure).

- Site D is an L shaped test site approximately 3.5 sq. miles in area located about 38 miles west of Key West centered at 24° 32' North and 82° 30' West.
- Site H is a 1 mile by 3 mile test area located 75 miles northwest of Key West centered at 24° 50.5' North and 83° 5.5' West.
- Mine Countermeasure Research. The Office of Naval Research occasionally sponsors research, in which allied forces participate, pertinent to mine operations in the shallow-water carbonate environment of the Sanctuary, using vessels greater than 50 meters in length in the Area To Be Avoided, and uses this environment to test the next generation of environmental monitoring and prediction systems for the next generation of mine countermeasure class ships.
- Corrosion and Coatings Tests. The Naval Research Laboratory/Marine Corrosion Facility at Fleming Key conducts a wide variety of corrosion and coatings tests utilizing sea water from the Sanctuary.
- Acoustic Research. Naval acoustic research vessels occasionally operate out of Key West harbor and conduct research activities in the Sanctuary.

Onshore Operations

Naval Air Station Key West consists of a number of land-based annexes in the Lower Keys, accounting for about 6,400 acres. Boca Chica Field, located on Boca Chica Key, and one communication site on Saddlebunch Key account for a majority of all lands.

There are also a number of annexes in Key West, including storage and supply sites, military housing, the Navy commissary, and a medical clinic.

Boca Chica Field contains facilities for airfield operations, aircraft storage and maintenance, administration, supply, housing, recreation and facility maintenance. An Air Installation Compatible-Use Zone (AICUZ) surrounds the air station. Compatible use in future development around the airfield is a primary goal of the AICUZ program at NAS Key West.

NAS Key West serves transient flight units from around the country and has one squadron permanently based on board. Over 20 types of fixed wing and rotary wing aircraft typically deployed to NAS Key West for various durations. Typical aircraft include F-5s, F-15s, F-16s, F/A-18s, T-45s, E-2/C-2s, SH-3 and H-60s.

Aircraft currently home based at NAS Key West consist of 18 F-5N aircraft assigned to Fighter Composite Squadron 111 (VFC-111) and 2 MH-60S Search and Rescue helicopters assigned to NAS Key West.

In addition, the Department of Homeland Security owns 35 acres on Cudjoe Key commonly referred to as the blimp site. This site has historically supported two aerostats, one as a radar platform and another for television broadcasting.

Port Operations

Truman Annex is home to NAS Key West's Port Operations Department. NAS Key West's support of warfighting readiness includes a strategically-located port and harbor. Port Operations supports a myriad of maritime customers, including U.S. Navy and international navy warships, and vessels from United States Naval Ships (USNS), NOAA and Army Corps of Engineers.

Port facilities include:

- The Mole Pier - refers to the breakwater pier at the western portion of Truman Annex, which separates Truman Harbor from the ship channel. This pier contains three primary ship berths; the Outer Mole, North Inner Mole, and South Inner Mole.
 - The Outer Mole Berth refers to the large 650 foot single berth on the channel side of the Mole Pier and can support up to a 1000 foot vessel.
 - The Inner Mole refers to the two berths on the Truman Harbor side of the Mole Pier. The North Inner Mole Berth and the South Inner Mole berth are each 600 feet long.
- The Ramp: refers to the boat ramp located in the southeast corner of the harbor bordered on the north by the East Quay and on the west by the South Quay. This ramp is owned by the City of Key West ex cessed as a result of BRAC 95. The Navy has a perpetual right of ingress, egress and use of the ramp.
- The East Quay: refers to the 1511-foot wharf on the eastern border of Truman Harbor.
- Truman Harbor: refers to all of the berths comprising the Mole Pier, South Quay, Ramps, East Quay and the body of water enclosed in this Perimeter.
- Pier 8: refers to the 367-foot finger pier extending north from the South Quay.
- The South Quay: refers to the 1149-foot bulkhead on the southern border of Truman Harbor. It extends from the eastern base of the Mole Pier to the western opening of the large boat ramp. The National Oceanographic and Atmospheric Administration (NOAA) owns 260 feet of the South Quay structure starting 60 feet west of the western ramp face. There is small boat ramp located along the southern side of the South Quay, west of Pier 8.

A variety of small surface craft are used in support of harbor management, including training, water transportation, pollution control, search and rescue, and other similar management functions. These small craft include security boats, oil boom deployment boats, work boats, crew boats, utility boats, personal water craft and other similar vessels.

In water structures (i.e, bulkheads, mooring piles, bollards) in Truman Harbor require continuous maintenance and repair. Construction projects that have the potential to impact FKNMS trust resources require consultation under Sanctuary regulations.

Offshore Operations

- Air Operations. Various fixed wing and rotary wing aircraft operate from and around NAS Key West. For all such aircraft, normal approaches, transits, and holding patterns occur regularly per applicable Navy and Federal Aviation Administration (FAA) guidance. During normal flight operations for fixed wing aircraft, transit through the FKNMS and USFWS Wildlife Refuges will be at 3,000 feet or above with the following exception. Departure and landing patterns that take aircraft over the FKNMS and U.S. Fish and Wildlife Service (USFWS) Wildlife Refuges at altitudes below 1000 feet.
- Search and Rescue (SAR) operations and any military operations using NAS Key West as a staging base can occur with little or no notice. Much of the airspace over and close to the station is designated as restricted. Air operations on the station are conducted per a consultation between the Navy and the U.S. Fish and Wildlife Service, undertaken pursuant to the Endangered Species Act for the protection of the Lower Keys marsh rabbit.

NAS Key West’s Search and Rescue (SAR) area of responsibility is one of the busiest in the Navy and extends 150 nautical miles from landing facilities in the Keys. During real world missions, SAR flights will go wherever they are needed and will entail hovering over, landing on and insertion of swimmers and small boats (including personal water craft) into the water.

Navy SAR training is conducted per Naval Instructions and Naval Air Training and Operating Procedures Standardization (NATOPS) flight manuals. Navy SAR pilots and co-pilots are briefed on local area familiarization during course rules briefings, including;

- No flying below 500 feet (vertical) or within 500 feet (horizontally) of any backcountry island within the FKNMS or USFWS Wildlife Refuge while training.
- No Landing of aircraft within the FKNMS or USFWS Wildlife Refuge while training.
- Air Combat Maneuvering (ACM). The reserved airspace around NAS Key West is of critical importance to the Atlantic Fleet’s aviation training. This area represents one of the largest areas available for overwater and littoral aviation warfare training. Marine Corps and Navy fighter and attached aircraft squadrons visit the Station and conduct basic and advanced ACM training and carrier qualification training in the designated air-space. This training at times entails super-sonic flight and low level flight, which can result in short periods of high noise levels. One training fighter squadron, VFC-111, operates out of the Station most of the year as an “adversary” squadron to provide an “enemy” for aircrews undergoing training. Air Force fighter squadrons also use this airspace for the same purposes. Live gunnery exercises are conducted from time to time in designated areas with towed sleeves as targets.
- Air to Surface Ordnance. Military aircraft periodically use a designated bombing range located just west of Marquesas Key, west of the Station and east of the Dry Tortugas. This range, known as Patricia Target, consists of a World War II vintage hulk that is aground just west of Marquesas Key. Aircraft make runs on this hulk in order to perfect at-sea delivery of ordnance. It is currently unattended and non-instrumented. The target is currently available for “cold”

runs. Demolition Key, located north of Fleming Key is used as a visual landmark for training. No live or inert ordnance is dropped on Demolition Key. Demolition Key is reserved to train with a maximum limit of Class I Division I net explosive weight of 5 pounds or less.

- Submarine Operations. Submarines engage in operations and training, including training in conjunction with Research, Development, Testing and Evaluation (RDT&E) in the Sanctuary. Occasionally, submarines fire exercise torpedoes. These firings take place outside the Sanctuary.
- Sonobuoys. The Naval Air Warfare Center tests sonobuoys and conducts diver training operations. Typically, buoys are gravity launched from an aircraft into shallow water and then recovered by divers in scuba equipment.
- Special Warfare Operations. Enclosure (1) “*U.S. Navy Training and Testing Activities In the Vicinity of the Florida Keys National Marine Sanctuary*” provides additional descriptions of these activities and maps illustrating where these activities take place.

Other Department of Defense Activities

Fuel Deliveries.

NAS Key West’s fuel supplies come by sea by way of the Hawk Channel Cut. Approximately one Military Sealift Command (MSC) tanker per month delivers aviation fuel to Key West Pipeline Company (KWPC). KWPC receives jet fuel from tankers that moor and off-load at Pier D-2 (USCG Sector Key West) located approximately 1,000 feet west of their Trumbo Point tank farm. KWPC bulk storage facility is located on Trumbo Point Annex, Key West, Florida. KWPC facility includes fuel storage and transfer infrastructure, which consists of a fuel offloading system, storage tanks, pump station, and pipeline system to supply jet fuel to the storage tanks at the NAS Key West tank farm on Boca Chica Key. The jet fuel is transferred from the KWPC tanks to the NAS Key West tanks on Boca Chica Key via an underground / underwater pipeline owned by KWPC. Portions of the pipeline are within the FKNMS.

Shipboard Operations.

Protection of the marine environment is mission essential. Navy ships conduct operations, in port and at sea, minimizing or eliminating any adverse impact on the marine environment and its resources. While transiting the FKNMS ships and submarines avoid adverse impacts on sanctuary resources and qualities. Ships and submarines minimize, to the maximum extent practicable, any solid waste, sewage, bilge water, or ballast water discharges.

Unexploded Ordnance (UXO) and Mine Detonation

Navy response is per the Office of the Chief of Naval Operations (OPNAV) Instruction 8027.6F (Naval Responsibilities for Explosive Ordnance Disposal).

Non-emergency Mine Exploitation. If UXO or a mine is found and it is not considered an immediate threat to human life or the environment, it may be moved to one of the three deep offshore underwater detonation areas (identified in the 1996 FKNMS EIS) or to a shallow water location for detonation. In 1997 three shallow water sites were identified in coordination with the FKNMS and USFWS:

- West/Southwest of the Marqueses Keys (24° 33’ N; 82° 25’ W)
- Northeast of Turtle Crawl Bank (24° 50’ N; 81° 11’ W)

- Maryland Shoal Area (24° 30' N; 81° 34' W)

U.S. Navy Training and Testing Activities

In the Vicinity of the Florida Keys National Marine Sanctuary & Key West and Great White Heron National Wildlife Refuges

Naval Air Station (NAS) Key West is one of the premier Navy tactical aviation training installations in the United States. Due to the year around flying weather and direct access to outstanding military airspace, operating areas, and tactical support facilities; NAS Key West hosts tactical air squadrons from units stationed both on the east and west coast of the United States. For the same reasons NAS Key West is in demand as a venue for aviation training and support; it is also a valued installation that supports Navy surface ships, expeditionary forces, special warfare units, and tenants from various other commands within the Department of Defense. This includes Navy Systems commands that conduct research and testing of potential future Navy platforms.

The types of Navy activities that occur within the vicinity of the Florida Keys National Marine Sanctuary (FKNMS) and the Key West and Great White Heron National Wildlife Refuges (Refuge) are broken down into summary tables below by Navy warfare training areas. The primary warfare training activities being conducted in the NAS Key West area of responsibility include Air Warfare, Electronic Warfare, Surface Warfare, Expeditionary Warfare, and Special Warfare. There is also a table to illustrate the Navy Systems command research and development activities. These activities may include the use of Unmanned Aerial Systems (UAS).

The majority of these activities are conducted outside of the current FKNMS and Refuge boundary and the proposed expanded boundaries. This includes the training and testing activities analyzed in the Atlantic Fleet Testing and Training (AFTT) Environmental Impact Statement completed in 2013 as well as other previously completed National Environmental Policy Act (NEPA) documents by various Navy commands. The individual NAS Key West activity maps illustrate the training and testing activities conducted within the littoral areas of the Florida Keys.

TABLE 1: AIR WARFARE:

Activity	Activity Description	NEPA
Air Combat Maneuver (ACM)	<ul style="list-style-type: none"> • Air crews engage in flight maneuvers designed to gain a tactical advantage during aerial combat. • These events may be supported by ground controllers for ground-controlled intercepts. 	FKNMS EIS ¹ AFTT ²
Air to Air Gunnery (GUNEX)	<ul style="list-style-type: none"> • Air Crews defend against threat aircraft with cannons (machine guns). • Air Gunnery events are conducted with either organic aircraft or support aircraft towing a banner target. • These events are usually conducted or combined with other training, such as with ACM events. 	FKNMS EIS AFTT
Air to Air Missile (MISSILEX)	<ul style="list-style-type: none"> • Air crews defend against threat with missiles. • Training operations include air to air missiles fired from tactical aircraft against unmanned aerial targets. 	AFTT

Search & Rescue (SAR)	<ul style="list-style-type: none"> Rotary wing air crews train to search and rescue down pilots, persons overboard, or civilians potentially lost at sea. Includes combat search and rescue training. Aviation rescue swimming training is conducted within the certified drop zones in the NASKW area of responsibility. 	FKNMS EIS AFTT
Air to Surface Ordnance Release (BOMBEX)	<ul style="list-style-type: none"> Air to surface ordnance release involving training of strike fighter aircraft in delivery of bombs against surface maritime targets. Authorized ordnance for training at the Patricia (Target) Range is limited to inert ordnance with smoke markers. Training is limited to unit level training only. 	FKNMS EIS AFTT

- 1996 Final Management Plan/Environmental Impact Statement for the Florida Keys National Sanctuary
- 2018 Atlantic Fleet Training and Testing (AFTT) Final Environmental Impact Statement (EIS)/ Overseas Environmental Impact Statement (OEIS)

TABLE 2: ELECTRONIC WARFARE:

Activity	Activity Description	NEPA
Chaff Exercise	<ul style="list-style-type: none"> Fixed wing aircraft deploy chaff to disrupt threat targeting and missile guidance radars and to defend against attack. These events are usually conducted or combined with other training, such as with ACM events. 	FKNMS EIS ¹ AFTT ²
Flare Exercise	<ul style="list-style-type: none"> Fixed wing aircraft and helicopters deploy flares to disrupt threat targeting and to defend against an infrared missile attack. These events are usually conducted or combined with other training, such as with ACM events. 	FKNMS EIS AFTT

- 1996 Final Management Plan/Environmental Impact Statement for the Florida Keys National Sanctuary
- 2018 Atlantic Fleet Training and Testing (AFTT) Final Environmental Impact Statement (EIS)/ Overseas Environmental Impact Statement (OEIS)

TABLE 3: SURFACE WARFARE:

Activity	Activity Description	NEPA
Gunnery Exercise	<ul style="list-style-type: none"> Ship crews engage surface targets with small and large caliber guns. Small caliber training is designed to provide close range support against small boat attacks. Large caliber training is designed to provide defense against other surface ships or longer range targets. 	AFTT ²

Submarine Tracking and/or Torpedo Exercise	<ul style="list-style-type: none"> • Surface ship crews search for, track, and detect submarines to determine a firing position to launch a torpedo and attack the submarine. • Generally a single ship unit level training event. • Tracking exercises do not require a submarine as a target; a simulated target is often used. • Tracking exercise becomes a torpedo exercise when the ship launches an exercise torpedo. 	FKNMS EIS ¹ AFTT
Maritime Intercept Operations	<ul style="list-style-type: none"> • Surface ship crews train on how to conduct visit, board, search and seizure (VBSS) on vessels of interest. • Target vessels vary depending upon vessel availability. • Training includes compliant and non-compliant boarding procedures. • Training may include helicopters. 	AFTT
Maritime Security Operations	<ul style="list-style-type: none"> • Surface ship and helicopter crews conduct a suite of maritime security operations. • Training includes counter piracy, ship force protection, warning/disabling fire, and oil platform defense. 	AFTT
Miscellaneous Shipboard Training	<ul style="list-style-type: none"> • Man overboard drills • Damage Control exercises and training. • Shipboard navigation. • Organic helicopter flight and vertical lift training 	AFTT

1. 1996 Final Management Plan/Environmental Impact Statement for the Florida Keys National Sanctuary
2. 2018 Atlantic Fleet Training and Testing (AFTT) Final Environmental Impact Statement (EIS)/ Overseas Environmental Impact Statement (OEIS)

TABLE 4: EXPEDITIONARY WARFARE:

Activity	Activity Description	NEPA
Mobile Dive and Salvage Operations	<ul style="list-style-type: none"> • Advanced diving skills training conducted to a maximum of 240 feet. • Includes surface supplied dives, underwater breathing apparatus dives, and recompression chamber operations. • Remotely operated vehicle operations to support salvage training, includes recovery of small objects on the ocean floor. 	AFTT ²
Explosive Ordnance Disposal (EOD) Dive Training	<ul style="list-style-type: none"> • Underwater breathing apparatus dive supervisor initial training at a maximum depth of 160 feet. • Training includes floating decompression and recompression chamber operations. 	AFTT

Mine Neutralization	<ul style="list-style-type: none"> • Mine Countermeasures training with the use of underwater explosives charges to destroy or neutralize simulated mines. • Training is conducted only in approved sites and the maximum explosive charge is 20 pounds (Net Explosive Weight) • Training can be conducted off of surface ships, small boats, or helicopters. 	AFTT
Parachute Operations	<ul style="list-style-type: none"> • Static line and military free fall parachute insertion operations from rotary or fixed wing aircraft into a water or land drop zone. 	FKNMS EIS ¹ NSW dEA ³

1. 1996 Final Management Plan/Environmental Impact Statement for the Florida Keys National Sanctuary
2. 2018 Atlantic Fleet Training and Testing (AFTT) Final Environmental Impact Statement (EIS)/ Overseas Environmental Impact Statement (OEIS)
3. 2018 Draft Environmental Assessment (dEA) for Naval Special Warfare (NSW) Training in the Vicinity of Key West, Florida.

TABLE 5: SPECIAL WARFARE:

Activity	Activity Description	NEPA
Combat Swimmer Training	<ul style="list-style-type: none"> • Special Warfare units will conduct combat swimming training, to include advance combat swimmer. • Conduct long underwater swims with simulated weapons package to ensure proper ballasting and water proofing. • Training includes underwater navigation, stealth swim techniques, water survival training, and deployment of simulated weapons packages against target vessels. 	FKNMS EIS ¹ NSW dEA ³
Maritime Intercept Operations (Level III)	<ul style="list-style-type: none"> • Advanced training to conduct visit, board, search and seizure (VBSS) on vessels of interest. (Level III) • Target vessels vary depending upon vessel availability. Training includes compliant and non-compliant boarding procedures. • Training may include helicopters. 	AFTT ²
Underwater Vehicle Training	<ul style="list-style-type: none"> • Training with the use of delivery and dry combat submersibles. • Training may include long range navigation, surveillance, harbor penetration and combat swimming. • Interoperability training with Submarine Forces. 	FKNMS EIS NSW dEA
Parachute Operations	<ul style="list-style-type: none"> • Static line and military free fall parachute insertion operations from rotary or fixed wing aircraft into a water or land drop zone. 	FKNMS EIS NSW dEA
Naval Special Warfare Small Boat and Boat Coxswain Training	<ul style="list-style-type: none"> • Training is for both Special warfare combatant-craft crewmen and basic crewman training and qualification. • Routine high speed defensive tactical boat maneuvers while deploying forces during insertion (unloading crew on land) and extraction (loading crew from land to boat) 	FKNMS EIS NSW dEA

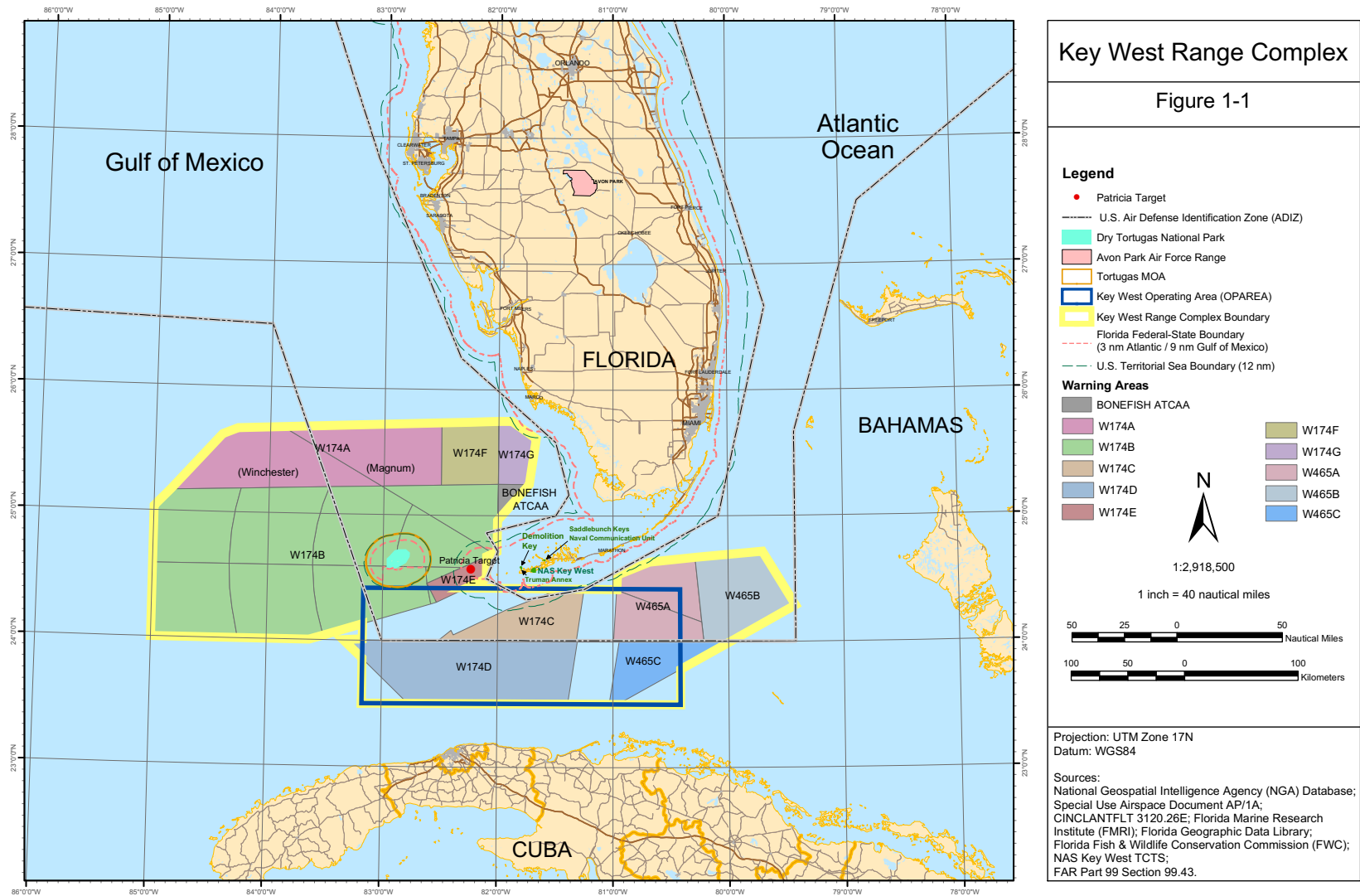
Beach Assault	<ul style="list-style-type: none"> Special Warfare unit training to conduct over the beach assaults from the sea. Training can be conducted with the support of helicopters, small boat units, and inflatable crafts in the near shore waters. 	FKNMS EIS NSW dEA
Proposed: Unmanned Aerial System (UAS) Activities	<ul style="list-style-type: none"> Nighttime launch and recover Special Operation Forces (SOF)-unique UAS simultaneously while conducting SOF combat swimmer, special reconnaissance and direct action mission training. 	NSW dEA
Proposed: Demolition Training	<ul style="list-style-type: none"> Personnel place limpet mines or disable threat mines using explosive charges. 	AFTT ²

- 1996 Final Management Plan/Environmental Impact Statement for the Florida Keys National Sanctuary
- 2018 Atlantic Fleet Training and Testing (AFTT) Final Environmental Impact Statement (EIS)/ Overseas Environmental Impact Statement (OEIS)
- 2018 Draft Environmental Assessment (dEA) for Naval Special Warfare (NSW) Training in the Vicinity of Key West, Florida.

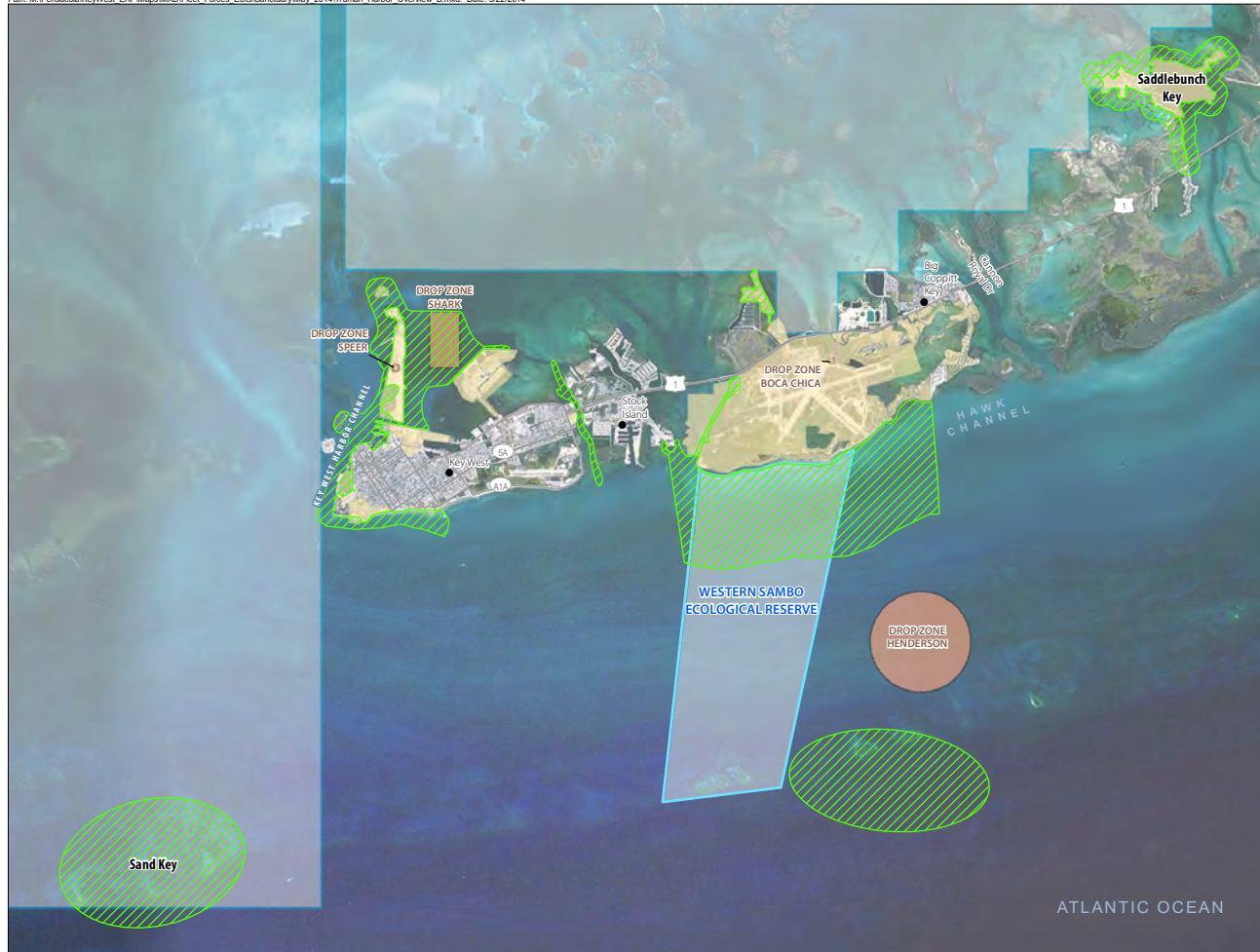
TABLE 6: NAVY SYSTEMS COMMANDS RESEARCH AND TEST EVENTS:

Activity	Activity Description	NEPA
Air Platform / Vehicle Testing	<ul style="list-style-type: none"> Testing to quantify the flying qualities, handling, airworthiness, stability, controllability, and integrity of air platforms or vehicles. No weapons releases included in the testing. 	AFTT ²
Sonobuoy Lot Acceptance Testing	<ul style="list-style-type: none"> Sonobuoys are deployed from surface vessels and aircraft to verify integrity and performance of a lot or group in advance of delivery to the fleet for operational use. 	FKNMS EIS ¹ AFTT
Submarine Land Attack Missile Testing	<ul style="list-style-type: none"> Testing of a submarine launch of a land attack missile from the Key West Operating Area into Eglin Air Force Base. Missile test includes fixed wing aircraft tracking the flight into Eglin as a safety precaution. 	AFTT
Combat System Ship Qualification Trail	<ul style="list-style-type: none"> Test of shipboard sensor capabilities to detect and track surface targets and then relay the data to the weapon system and engage the target. 	AFTT
Submersible Testing	<ul style="list-style-type: none"> Testing of Navy submersibles and the capability to support personnel and payload insertion and extraction from strategic distances. 	AFTT
Surface /Subsurface Platform/ship Testing	<ul style="list-style-type: none"> In water testing to quantify the qualities, handling, seaworthiness, stability, controllability, and integrity of surface/subsurface platforms or ships. 	AFTT

- 1996 Final Management Plan/Environmental Impact Statement for the Florida Keys National Sanctuary
- 2018 Atlantic Fleet Training and Testing (AFTT) Final Environmental Impact Statement (EIS)/ Overseas Environmental Impact Statement (OEIS)



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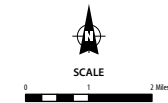


Training Overview-Key West
Key West OPAREA
Key West, Florida

Legend

- City/Town
- Installation Property
- ▨ Existing Navy Training
- Drop Zone
- Wildlife Refuge Boundary

NOTE: Entire map extent falls within Florida Keys National Marine Sanctuary



Source: ESRI 2011; Imagery: National Agriculture Imagery Program (NAIP), NAVFAC SE, U.S. Fish and Wildlife Service 2001, NOAA 2004.
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Enclosure (1) Map 1



Enclosure (1) Map 2



Enclosure (1) Map 3

Path: M:\Pensacola\KeyWest_EAP\Maps\MDC\Fleet_Forces_Edits\Sanctuary\May_2014\Sigsbee.mxd



**Sigsbee Park Annex
and Naval Branch Health Clinic**
Key West OPAREA
Key West, Florida

Legend

- Installation Property
- Existing Navy Training
- Drop Zone

NOTE: Entire map extent falls within Florida Keys National Marine Sanctuary



SCALE



SOURCE: NAVFAC SE, Received 2014; ESRI 2011; Ecology & Environment 2014; HDR, Inc. 2011; Fish and Wildlife Service 2001; NOAA 2004.

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Enclosure (1) Map 4



**NAS Key West -
Boca Chica Field (West)**
Key West OPAREA
Key West, Florida

Legend

- Installation Property
- Existing Navy Training
- Wildlife Refuge Boundary

**NOTE: Entire map extent
falls within Florida Keys
National Marine Sanctuary**

Enclosure (1) Map 5

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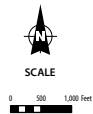


**NAS Key West -
Boca Chica Field (East) and
Geiger Key Hawk Missile Site**
Key West OPAREA
Key West, Florida

Legend

- Installation Property
- Existing Navy Training
- Drop Zone
- Wildlife Refuge Boundary

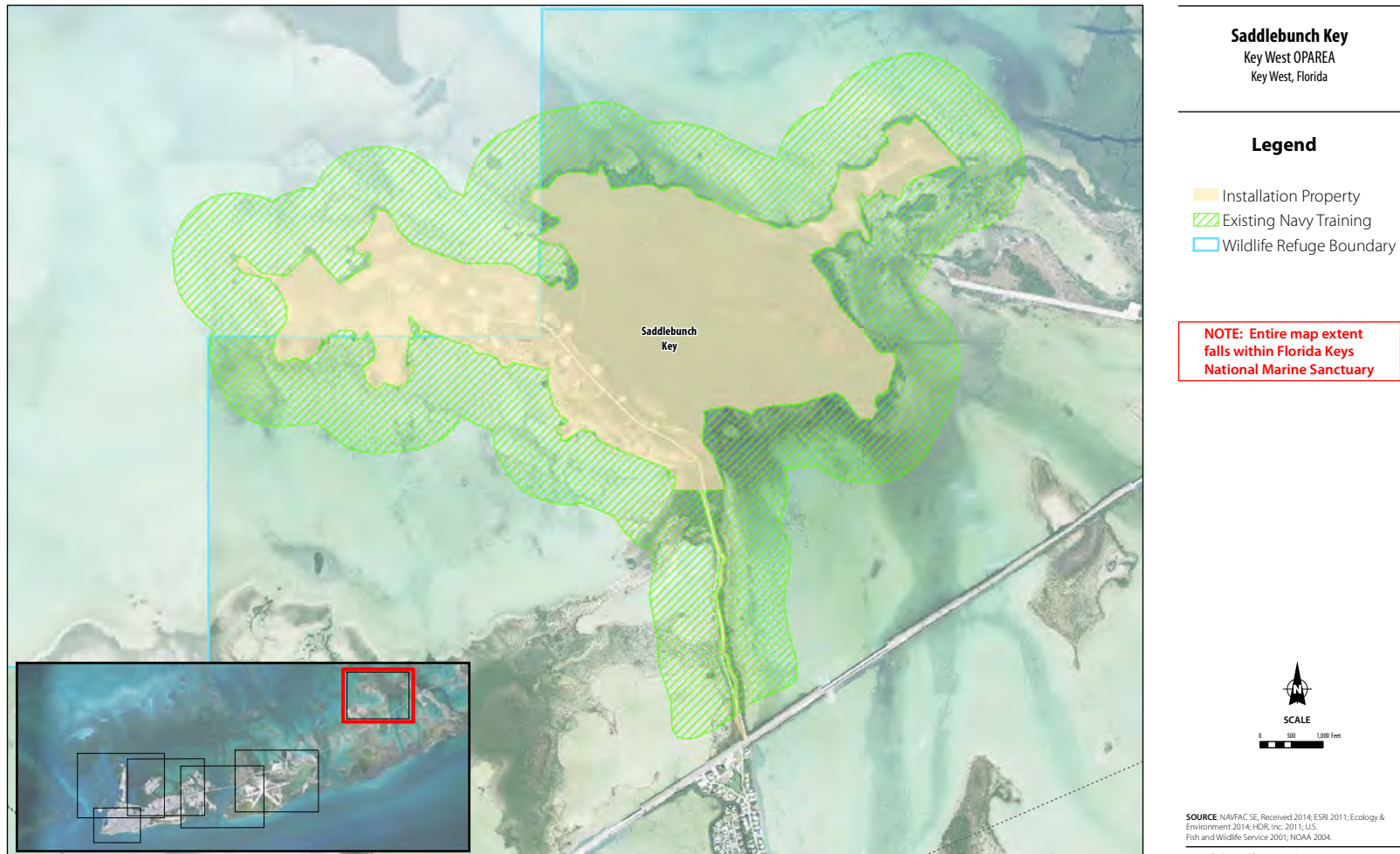
**NOTE: Entire map extent
falls within Florida Keys
National Marine Sanctuary**



SOURCE: NAVFAC SE, Received 2014; ESR 2011; Ecology & Environment 2014; HDR, Inc. 2011; Fish and Wildlife Service 2001; NOAA 2004.

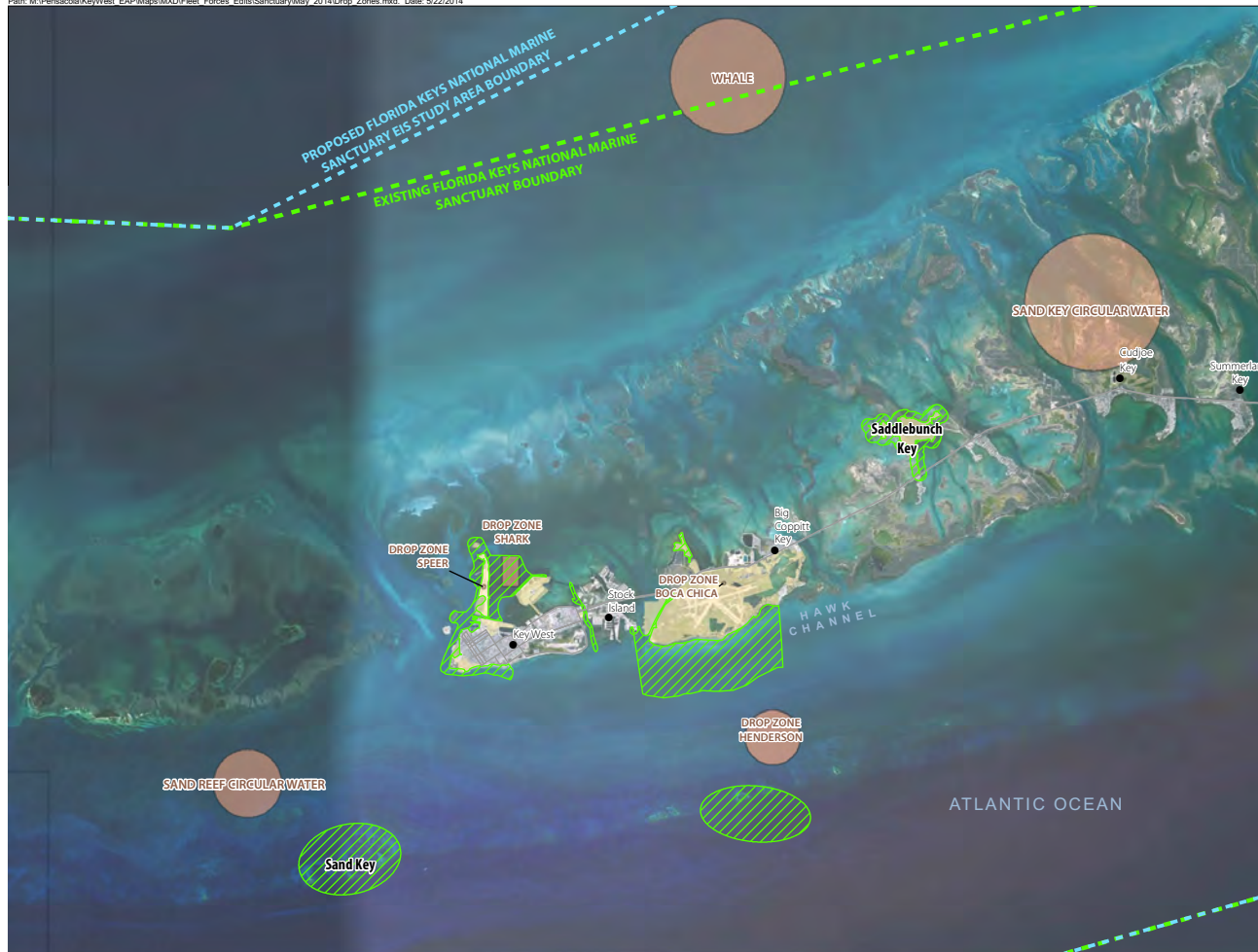
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Enclosure (1) Map 6



Enclosure (1) Map 7

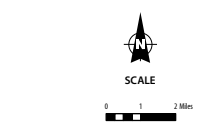
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**Key West
Drop Zones**
Key West OPAREA
Key West, Florida

- Legend**
- City/Town
 - Installation Property
 - Existing Navy Training
 - Drop Zone
 - Proposed Florida Keys National Marine Sanctuary EIS Study Area Boundary
 - Existing Florida Keys National Marine Sanctuary Boundary

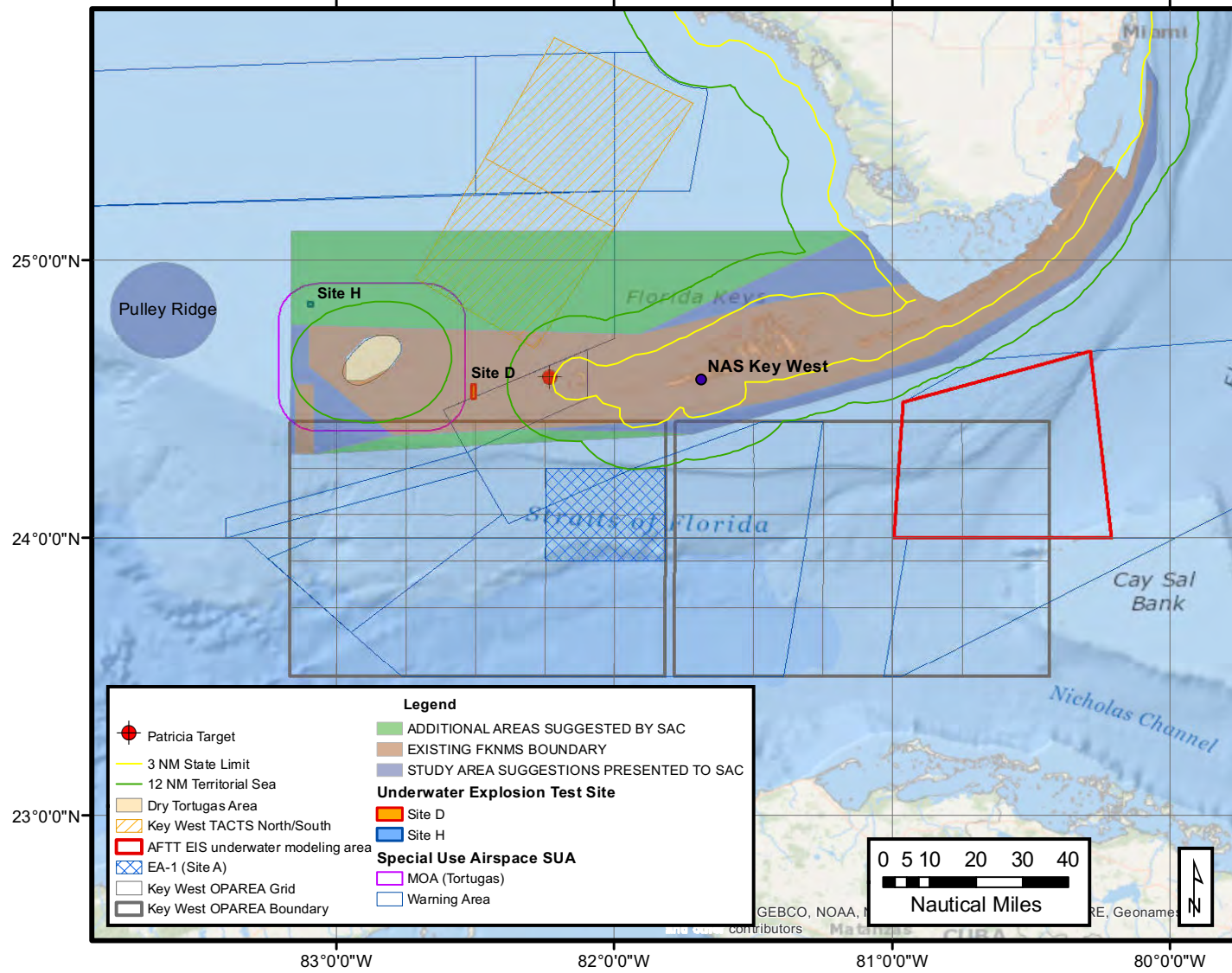
NOTE: Entire map extent falls within Florida Keys National Marine Sanctuary



SOURCE: NAVFAC SE, Received 2014; ESR 2011; Ecology & Environment 2014; HDR, Inc. 2011; Fish and Wildlife Service 2001; NOAA 2004.
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Enclosure (1) Map 8

Key West Offshore Detonation Areas



Enclosure (1) Map 9

APPENDIX G CORRESPONDENCE



18-063915

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, DC 20240
OCT 24 2018

RDML Tim Gallaudet, Ph.D., USN Ret.
Assistant Secretary of Commerce for Oceans and Atmosphere and Acting Under Secretary of
Commerce for Oceans and Atmosphere
U.S. Department of Commerce
Washington, D.C. 20230

Dear Dr. Gallaudet:

We received your request to evaluate the potential expansions of the Monitor National Marine Sanctuary and the Florida Keys National Marine Sanctuary, pursuant to section 4(a) of Executive Order 13795, *Implementing an America-First Offshore Energy Strategy* (April 28, 2017). The National Oceanic and Atmospheric Administration is considering these expansions to protect and preserve historic shipwrecks in Federal waters off the coast of North Carolina, and protect additional coral reefs and sensitive areas in Federal waters off the Florida Keys.

In the enclosed documents, the Bureau of Ocean Energy Management (BOEM) has responded to your request with a completed review of offshore energy and mineral resource potential within the designated areas, as well as a review of the potential impacts the proposed expansions will have on the development of those resources.

If you have any questions, please contact Dr. Walter D. Cruickshank, BOEM Acting Director, at (202) 208-6300 or Walter.Cruickshank@boem.gov.

Sincerely,

Joseph R. Balash
Assistant Secretary
Land and Minerals Management

Enclosures (2)



**BOEM Review of Offshore Energy and Mineral Resources
Potential Expansion of Florida Keys National Marine Sanctuary
October 3, 2018**

The National Oceanic and Atmospheric Administration (NOAA), Office of National Marine Sanctuaries (ONMS) has proposed to expand the geographic area of the Florida Keys National Marine Sanctuary (FKNMS). This document presents the results of a BOEM review of the impacts of the proposed expansions on offshore energy or mineral resources. As required under section 4(a) of Executive Order 13795, *Implementing an America-First Offshore Energy Strategy* (April 28, 2017), this paper focuses on offshore energy from wind, oil, natural gas, and methane hydrates. BOEM has also included information regarding potential impacts on offshore marine minerals.

NOAA is proposing to expand the FKNMS boundaries to one of several possible alternatives. BOEM has analyzed the potential impacts to renewable energy resources within the largest proposed expansion area alternative. **Figure 1** shows the existing FKNMS and the outline of the largest proposed expansion alternative. The FKNMS and proposed expansion areas are located in two Outer Continental Shelf (OCS) planning areas: (1) the Eastern Planning Area in the Gulf of Mexico OCS Region and (2) the Straits of Florida Planning Area in the Atlantic OCS Region.

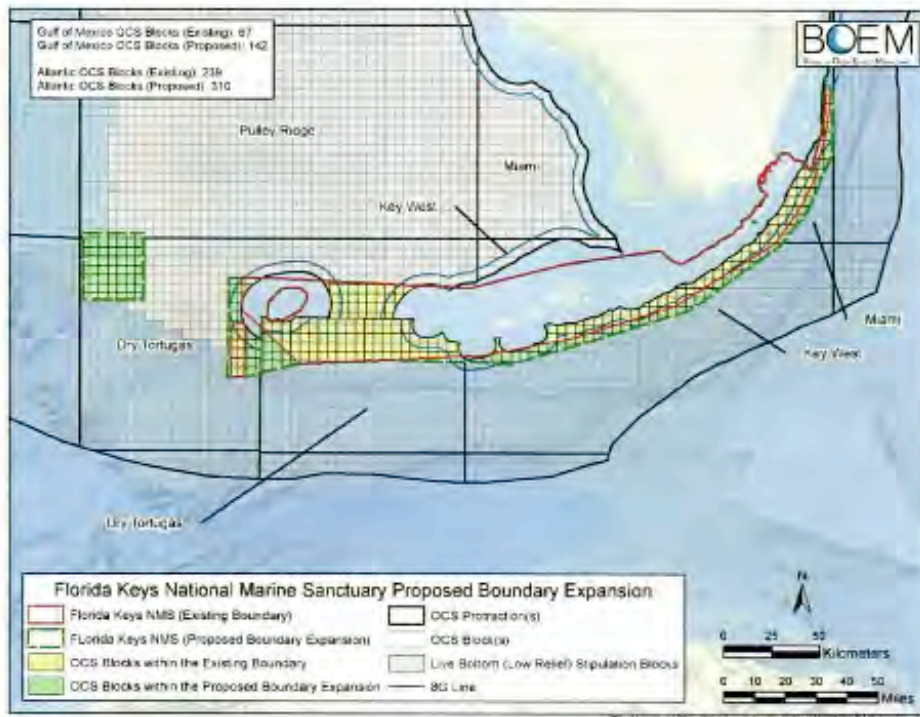


Figure 1

BOEM REVIEW OF POTENTIAL OFFSHORE WIND IMPACTS

Gulf of Mexico – Offshore Wind Impacts

Eastern Planning Area (Dry Tortugas/Pulley Ridge Areas)

Currently, there are 67 Eastern Planning Area OCS blocks in the existing FKNMS. The proposed expansion will add an additional 75 Eastern Planning Area OCS blocks to the FKNMS, resulting in a total of 142 Eastern Planning Area OCS blocks in the expanded FKNMS.

Activities prohibited in the FKNMS include alteration of, or construction on, the seabed of the Sanctuary. Because drilling into, dredging, or altering the seabed of the FKNMS would not be permitted, any OCS block that becomes part of the FKNMS as a result of expansion would not be available for offshore wind energy leasing using turbines fixed to the seabed.

Unlike the northern Atlantic seaboard, to date, very little is known about the renewable energy resource potential of the Gulf of Mexico OCS. Based on earlier studies conducted by the National Renewable Energy Laboratory (NREL) in Colorado, the greatest renewable energy resource potential was found in wind energy regimes located in the Western Planning Area off south Texas (Musial et al., 2016).

Figure 2 shows the wind speed potential in the Gulf of Mexico. The wind speed potential in the Eastern Planning Area in and around the FKNMS is <7.00 m/s. This is the lowest wind speed potential for the United States, and therefore, BOEM would not expect interest for offshore wind OCS leasing in the area of the FKNMS.



Figure 2. Offshore Wind Resource Data (Musial et al., 2016).

In 2017, NREL began exploring the feasibility of offshore renewable energy in the Gulf of Mexico in a study commissioned by BOEM. The study includes the Eastern and Straits of Florida Planning Areas. Together with BOEM and partners, NREL will select the most viable renewable energy technology in the Gulf of Mexico and perform more detailed economic and site-specific analysis to determine the cost and feasibility of a defined technology scenario. If the FKNMS is expanded, renewable energy potential discovered in this study would not be permitted in the FKNMS expansion areas because drilling into, dredging, or altering the seabed are prohibited activities in the FKNMS.

Currently, little to no renewable energy information or interest exists for this area of the Eastern Planning Area.

Atlantic – Offshore Wind Impacts

Straits of Florida Planning Area

Currently, there are 239 Straits of Florida OCS blocks in the existing FKNMS. The proposed expansion will add an additional 71 Straits of Florida OCS blocks to the FKNMS, resulting in a total of 310 Straits of Florida OCS blocks in the expanded FKNMS.

Activities prohibited in the FKNMS include alteration of or construction on the seabed of the Sanctuary. Because drilling into, dredging, or altering the seabed of the FKNMS would not be permitted, any OCS block that becomes part of the FKNMS as a result of expansion would not be available for offshore wind energy leasing using turbines fixed to the seabed.

Figure 2 (above) shows the wind speed potential in the Straits of Florida. The wind speed potential in the Straits of Florida in and around the FKNMS is <7.00 m/s. This is the lowest wind speed potential for the United States, and therefore, BOEM would not expect interest for offshore wind OCS leasing in the area of the FKNMS.

The Gulf of Mexico is connected to the Atlantic through the Straits of Florida. Here, strong currents flow around the tip of Florida, providing areas that could produce tidal and current renewable energy resources. For a number of years, the Florida Keys area (State waters) was looked at for possible tidal activity. But despite interest in State water tidal potential, little to no interest has been expressed in the southern portion of the Straits of Florida area for renewable energy activities on the OCS.

Florida Atlantic University (FAU), through its affiliation with BOEM and its predecessor the Minerals Management Service, has studied ocean currents along Florida's southeast coast and has determined practical underwater turbine operating areas just north of the Florida Keys and Miami. **Figure 3** shows the lease areas in the Straits of Florida Planning Area where FAU studied renewable energy in the Atlantic Ocean. The OCS blocks, which were relinquished in 2016, are north of the proposed FKNMS expansion area (USDOT, BOEM, 2018), and therefore would not be affected by a proposed Sanctuary expansion.

BOEM currently does not have any other renewable energy activity on OCS lease blocks in or near the proposed FKNMS expansion areas.

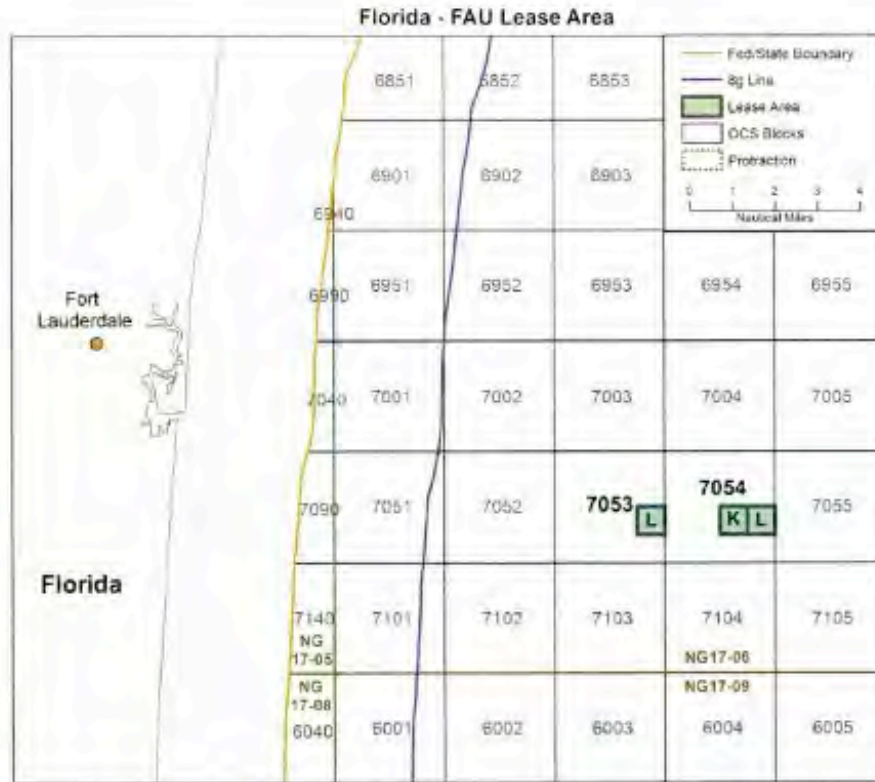


Figure 3. Florida-FAU Lease Area in the Straits of Florida Planning Area (USDOI, BOEM, 2018).

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Musial, W., D. Heimiller, P. Beiter, G. Scott, and C. Draxl. 2016. 2016 Offshore Wind Energy Resource Assessment for the United States. National Renewable Energy Laboratory. Technical Report NREL/TP-5000-66599. September 2016. Contract No. DE-AC36-08GO28308.

U.S. Department of the Interior. Bureau of Ocean Energy Management. 2018. Florida Activities. Internet website: <https://www.boem.gov/Florida/>. Accessed September 18, 2018.

BOEM REVIEW OF POTENTIAL OFFSHORE OIL AND GAS IMPACTS

This section discusses the impacts that expanding the area of the sanctuary could impose on BOEM's Oil and Gas Energy Program, specifically, on BOEM's stewardship obligations associated with enabling access to undiscovered resource potential on the OCS. BOEM decided to focus on Alternative 3 because it would have the largest potential impact in terms of accessing and discovering oil and gas reserves. Undiscovered resources become stranded on acreage added to marine sanctuaries because the acreage is no longer available for lease. The following analysis was designed to measure the level of impact in terms of *risked volumes of undiscovered oil and gas resources* that could be stranded on acreage no longer available for lease. The stranded volumes are reported in million barrels of oil equivalent (mmboe). The following analysis estimates the potential volume of undiscovered resources that may exist on the OCS acreage included in NOAA's proposal to expand the boundary of the FKNMS. The project methodology and assumptions used to generate the estimates are also included.

The potential volumes of oil and gas resources within the boundaries of the FKNMS proposed expansion area are thought to exist within reservoirs in two geologic plays. One of the plays is a confirmed play that has established hydrocarbon production - onshore south Florida. Based on the information available to BOEM, the potential reservoirs in this play are thought to extend offshore into the FKNMS proposed extension area, but the data currently available are insufficient for BOEM to identify individual oil and gas prospects using modern geoscientific principles and techniques. The second geologic play thought to exist in the FKNMS proposed expansion area is a conceptual play. Conceptual plays are identified based on the association of certain geologic attributes recognized in the assessment area with similar geologic attributes exhibited in confirmed geologic hydrocarbon plays known to exist in other oil and gas producing basins. In areas where there is little subsurface geoscientific data or where the volume of resource potential assessed is derived from a population of geologic plays where critical attributes of hydrocarbon prospectively are postulated or conceptual, the methodology used to develop estimates of undiscovered resource potential must recognize and address the high level of risk and uncertainty associated with such analyses.

The southeastern portion of the Eastern Gulf of Mexico and the Straits of Florida, the OCS protraction areas where the FKNMS is located, are considered frontier areas within the context of oil and gas exploration and development. Although some geological and geophysical data are available in portions of these areas, there is no direct evidence that allows BOEM to conclude that the presence of economically recoverable hydrocarbon volumes within the proposed FKNMS expansion area is an absolute certainty. Since it is possible that no recoverable resources exist within the FKNMS expansion area, the low-case impact estimate is zero (Figure 4).

The mid-case estimate of undiscovered resource potential allocated to the FKNMS proposed expansion area was derived from the total volumes of undiscovered resources assessed for two geologic plays for BOEM's 2016a National Assessment of Undiscovered Oil and Gas Resources of the U.S. Outer Continental Shelf. These two plays are the only plays that extend into the FKNMS expansion area. For each of the plays, a portion of the undiscovered resource volumes assessed for the entire play area was allocated to the acreage of the play that extends into the FKNMS proposed expansion area. These allocations are based on the ratio of the

acreage the play area covers within the proposed sanctuary expansion area and the total acreage of the play as it is thought to exist on the OCS. The area-based allocation method is commonly used for conceptual plays and was employed here by BOEM's Assessment Team to generate the mid-case impact estimate (Figure 4).

The high-case estimate of undiscovered resource potential generated for the FKNMS proposed expansion area was developed based on the field-size distributions that contain the undiscovered resource volumes assessed for two geologic plays for BOEM's 2016 National Assessment of Undiscovered Oil and Gas Resources of the U.S. Outer Continental Shelf. These two plays are the only plays that extend into the FKNMS expansion area. For each of the plays, the volumes of the most likely field-size generated by BOEM's Assessment Team were allocated to the acreage of the play that exists in the FKNMS proposed expansion area. The allocation of one discovery from each play was determined based on the acreage of the play area within the proposed sanctuary expansion area, the number of undiscovered pools anticipated in the play and the total acreage of the play as it is thought to exist on the OCS (Figure 4).

Geoscientific and operational data specific to frontier areas may not exist or is sparse. The total undiscovered resource potential assessed exists in postulated reservoirs associated with conceptual geologic plays or reservoirs from confirmed plays projected long distances with little data, and analyses performed by BOEM to develop estimates of undiscovered resource potential are based on a broad range of analogue information and assumptions. Although the use of analogue information to assess resource potential in frontier areas is common and widely accepted in the geoscientific community, the results generated should not be viewed with the same level of certainty as those generated in areas with confirmed petroleum systems, established oil and gas production and modern geoscientific and reservoir data specific to the area.

The analyses conducted were based, in part, on the assumption that: 1) NOAA's proposal to expand the boundaries of the FKNMS is approved, 2) the geographic area included in the FKNMS boundary expansion proposal is coincident with the geographic area used in BOEM's analyses, and 3) restrictions currently applicable to leasing activity and oil and gas activity within the boundaries of a National Marine Sanctuary will be imposed on all OCS acreage included within the FKNMS proposed expansion area.

The level of uncertainty associated with the analyses conducted demands that the level of impact is reported with a range of values. Low, mid and high case estimates are used to satisfy this demand.

Florida Keys National Marine Sanctuary Expansion Proposal

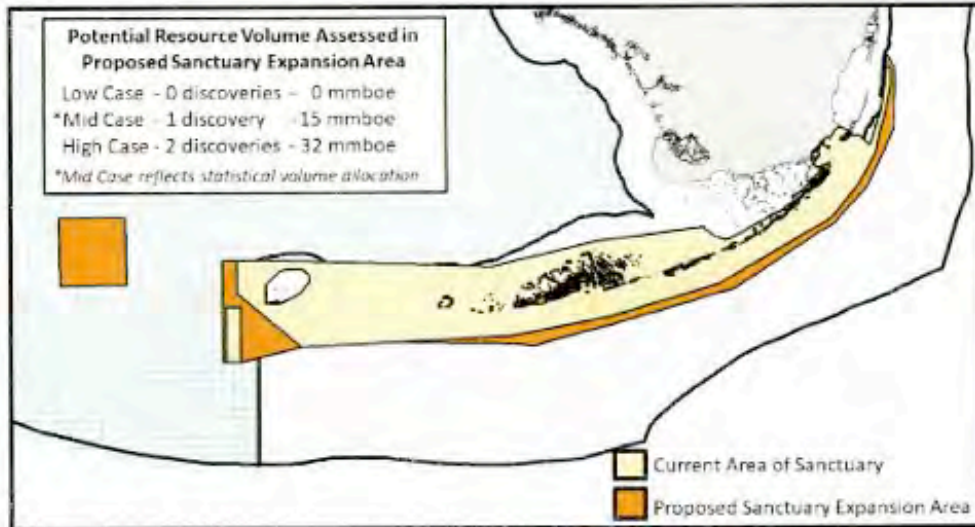


Figure 4. Range of values: risked volumes of undiscovered oil and gas resource potential that may exist within the proposed sanctuary expansion area

BOEM REVIEW OF POTENTIAL METHANE HYDRATES IMPACTS

BOEM has assessed the potential for methane hydrate resources in the proposed expansion area of FKNMS. Due to the shallow water depth of the proposed expansion area, the formation of methane hydrate in the subsurface is unlikely. Therefore, BOEM finds that the mean volume of in-place and technically recoverable methane hydrate resources in the proposed expansion area to be zero. The potential impact on the development of methane hydrate resources in the area of the proposed expansion of FKNMS will be negligible.

BOEM REVIEW OF POTENTIAL OFFSHORE MARINE MINERALS IMPACTS**Atlantic – Marine Mineral Impacts**

BOEM's Marine Minerals Program (MMP) has significant concerns with the proposed FKNMS expanded boundary, as it has the potential to limit marine minerals activity in Federal waters. **Figure 5** depicts expired OCS Marine Minerals Lease OCS-A-0481. This expired lease is located in the only OCS borrow area that has, to date, been identified for the Miami/Dade area, which suffers from continual erosion and is regularly in need of OCS sediment for beach renourishment. The proposed expansion area is less than **200 yards** from the OCS borrow area. The proposed expansion could limit the ability to expand the OCS borrow area eastward in the event additional sand is needed for beach renourishment because dredging is not permitted within the FKNMS.

Figure 5 also depicts the "Atlantic Sand Aliquots" (identified in the map within Blocks 6339, 6340, 6389, and 6390) that have been identified by BOEM as a location of potential sand resources. These Atlantic Sand Aliquots are within or just outside of the northern most proposed expansion area of the FKNMS. New OCS borrow areas within the Atlantic Sand Aliquots identified in the northern portion of the proposed expansion area would not be permitted in the proposed expansion area as dredging would not be permitted in the FKNMS. BOEM is concerned that dredging in close proximity to the expanded Sanctuary may also be prohibited.

BOEM recommends that NOAA coordination with USACE Jacksonville, the Florida Department of Environmental Protection, Miami Dade County, Broward County, and Palm Beach County be made a high priority in order to ensure that this proposed expansion will not impede the use of critical OCS sediment resources in the area.

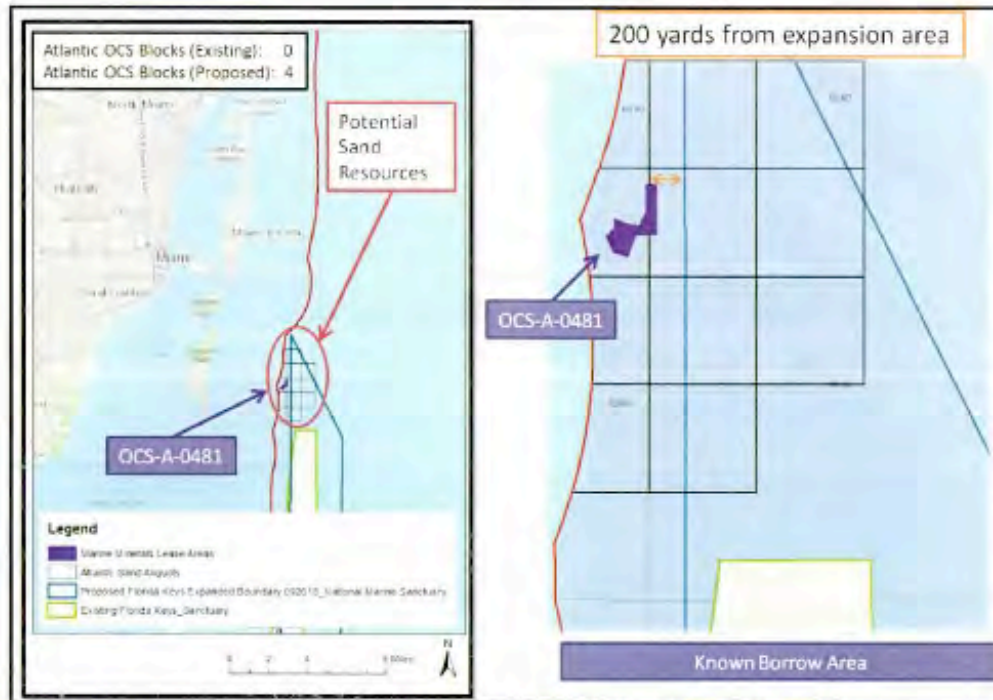


Figure 5. Expired OCS Marine Minerals Lease OCS-A-0481 and Atlantic Sand Aliquots.

Gulf of Mexico – Marine Minerals Impacts

Pulley Ridge Sanctuary – Expanded Boundary

BOEM’s Gulf of Mexico Marine Minerals Significant Sediment resource areas are currently greater than 50 miles from the proposed expanded boundaries (Figure 6) and, therefore, are not expected to be impacted by the proposed expansion of the FKNMS.



Figure 6. Location of BOEM's Gulf of Mexico Significant Sediment resource areas (black boxes) in relation to the proposed FKNMS expansion areas (blue outline).

**BOEM Review of Offshore Energy and Mineral Resources
Potential Expansion of Monitor National Marine Sanctuary
October 3, 2018**

The National Oceanic and Atmospheric Administration (NOAA), Office of National Marine Sanctuaries (ONMS) has proposed to expand the geographic area of the Monitor National Marine Sanctuary (MNMS). This document presents the results of a BOEM review of the impacts of the proposed expansions on offshore energy or mineral resources. As required under section 4(a) of Executive Order 13795, *Implementing an America-First Offshore Energy Strategy* (April 28, 2017), this paper focuses on offshore energy from wind, oil, natural gas, and methane hydrates. BOEM has also included information regarding potential impacts on offshore marine minerals.

BOEM REVIEW OF POTENTIAL OFFSHORE WIND IMPACTS

BOEM has the following comments and concerns with the identified Alternatives for the MNMS. Alternatives 1, 2 and 3 (the preferred alternative) all overlap, to various extents, with portions of BOEM's North Carolina Planning Areas 3 and 4, which have been identified for potential wind energy leasing (see Attachments 1, 2, and 3). BOEM is concerned that Alternatives 2 & 3, and to a lesser extent Alternative 1, would eliminate large areas that may be viable for future renewable energy development offshore North Carolina.

- Alternative 1: Overlaps with the northeast portion of North Carolina Planning Area 4, but does not overlap with North Carolina Planning Area 3. See Attachment 1.
- Alternative 2: Overlaps with the east and northeast portion of North Carolina Planning Area 4, but does not overlap with North Carolina Planning Area 3. See Attachment 2.
- Alternative 3: Overlaps with the east and northeast portion of North Carolina Planning Area 4 to the same extent as Alternative 2, and overlaps with portions of North Carolina Planning Area 3. See Attachment 3.

BOEM's current mitigation measures (enforced through lease stipulations and terms and conditions of plan approval) provide protection to shipwrecks and other archaeological sites, while allowing for multiple uses including offshore wind development. BOEM encourages NOAA to select Alternative 1 and, if necessary, coordinate with BOEM to develop additional mitigation measures to protect shipwrecks and other archaeological sites. At a minimum, NOAA should consider the impacts of eliminating areas from future wind energy development in their EIS. NOAA may consider the potential energy production that would not be developed if the proposed expansion areas are excluded.

For example, the exclusion areas total:

- Alternative 1 - 240,623 acres
- Alternative 2 - 642,451 acres
- Alternative 3 - 873,428 acres

Using the National Renewable Energy Laboratory (NREL's) 2016 Offshore Wind Technologies Market Report (NREL/TP-5000-64283), a standard capacity density assumption is 3 MW/km². Where, 1 km² = 247 acres; and therefore 3 MW/247 acres.

Therefore, the potential installation capacity of each proposed sanctuary alternative that would not be developed is as follows:

- Alternative 1 - 2,923 MW
- Alternative 2 - 7,803 MW
- Alternative 3 - 10,608 MW

Assuming the annual average wind speed at hub height on the Outer Continental Shelf (OCS) is 8.5 m/s (19 mph), and the installation of 8 MW turbines at 44.3% capacity, then the preliminary Annual Energy Output for each area would be:

- Alternative 1 - 365 turbines, 11,701,364,910 kWh per year
- Alternative 2 - 975 turbines, 31,257,070,650 kWh per year
- Alternative 3 - 1,326 turbines, 42,509,616,084 kWh per year

According to the US Energy Information Administration, in 2016 the annual average residential electricity consumption was 10,766 kWh. Note that there are a number of other environmental factors that play a role in the total number of installed turbines. These other environmental factors are not considered here.

NOAA should also be aware that under the Energy Policy Act of 2005 (Public Law 109-58 Sec. 388 (a)(10)), BOEM does not have regulatory authority *"on the outer Continental Shelf within the exterior boundaries of any unit of the National Park System, National Wildlife Refuge System, or National Marine Sanctuary System, or any National Monument."*

BOEM REVIEW OF POTENTIAL OFFSHORE OIL AND GAS IMPACTS

This section discusses the impacts that expanding the area of the sanctuary could impose on BOEM's Oil and Gas Energy Program, specifically, on BOEM's stewardship obligations associated with enabling access to undiscovered resource potential on the OCS. Undiscovered resources become stranded on acreage added to marine sanctuaries because the acreage is no longer available for lease. The following analysis was designed to measure the level of impact in terms of *risked volumes of undiscovered oil and gas resources* that could be stranded on acreage no longer available for lease. The stranded volumes are reported in million barrels of oil equivalent (mmboc). The following analysis estimates the potential volume of undiscovered resources that may exist on the OCS acreage included in NOAA's proposal to expand the boundary of the MNMS. The project methodology and assumptions used to generate the estimates are also included. Three alternatives, identified in the expansion proposal, are addressed. The results of our analyses are provided in a table included with *Figure 1a*, for Alternative 1, *Figure 1b* for Alternative 2 and *Figure 1c* for Alternative 3.

The potential volumes of oil and gas resources thought to exist within the boundaries of the MNMS proposed expansion area are thought to exist within reservoirs in two geologic plays. Both of the geologic plays thought to exist in the MNMS proposed expansion area are conceptual plays. Conceptual plays are identified based on the association of certain geologic attributes recognized in the assessment area with similar geologic attributes exhibited in confirmed geologic hydrocarbon plays known to exist in other oil and gas producing basins. In areas where there are little subsurface geoscientific data, or where the volume of resource potential assessed is derived from a population of geologic plays where critical attributes of hydrocarbon prospectively are conceptual, the methodology used to develop estimates of undiscovered resource potential must recognize and address the high level of risk and uncertainty associated with such analyses. BOEM's Assessment Team reviewed the information currently available in the MNMS study area and has concluded that the data are insufficient to identify individual oil and gas prospects using modern geoscientific principles and techniques.

The Mid Atlantic, the OCS planning areas where the MNMS is located, is considered a frontier area within the context of oil and gas exploration and development. Although some geological and geophysical data are available in portions of the area, there is no direct evidence that allows BOEM to conclude that the presence of economically recoverable hydrocarbon volumes within the proposed MNMS expansion area is an absolute certainty. Since the possibility that no recoverable resources exist within the MNMS expansion area, the low-case impact estimate is zero for each of the proposed alternatives (*Figures 1a, 1b, and 1c*).

The mid-case estimate of undiscovered resource potential allocated to the MNMS proposed expansion area was derived from the total volumes of undiscovered resources assessed for two geologic plays for BOEM's 2016a National Assessment of Undiscovered Oil and Gas Resources of the U.S. Outer Continental Shelf. These two plays are the only assessed plays that extend into the MNMS expansion area. For each of the plays, a portion of the undiscovered resource volumes assessed for the entire play area was allocated to the acreage of the play that extends into the MNMS proposed expansion area. These allocations are based on the ratio of the acreage the play area covers within the proposed sanctuary expansion area to the total

acreage of the play as it is thought to exist on the OCS. The area-based allocation method is commonly used for conceptual plays and was employed here by BOEM's Assessment Team to generate the mid-case impact estimate (*Figures 1a, 1b, and 1c*).

The high-case estimate of undiscovered resource potential generated for the MNMS proposed expansion area was developed based on the field-size distributions that contain the undiscovered resource volumes assessed for two geologic plays for BOEM's 2016a National Assessment of Undiscovered Oil and Gas Resources of the U.S. Outer Continental Shelf. These two plays are the only plays that extend into the MNMS expansion area. For each of the plays, the volumes of the most likely field-size generated by BOEM's Assessment Team for each of the plays, was allocated to the acreage of the play that exists in the MNMS proposed expansion area. The allocation of one discovery from each play was determined based on acreage of the play area thought to exist within the proposed sanctuary expansion area, the number of undiscovered pools anticipated in the play and the total acreage of the play as it is thought to exist on the OCS (*Figures 1a, 1b, and 1c*).

Geoscientific and operational data specific to the frontier area may not exist or is sparse. The total undiscovered resource potential assessed exists in postulated reservoirs associated with conceptual geologic plays, and analyses performed by BOEM to develop estimates of undiscovered resource potential are based on a broad range of analogue information and assumptions. Although the use of analogue information to assess resource potential in frontier areas is common and widely accepted in the geoscientific community, the results generated should not be viewed with the same level of certainty as those generated in areas with confirmed petroleum systems, established oil and gas production and modern geoscientific and reservoir data specific to the area.

The analyses conducted were based, in part, on the assumption that: 1) NOAA's proposal to expand the boundaries of the MNMS is approved, 2) the geographic area included in the MNMS boundary expansion proposal is coincident with the geographic area used in BOEM's analyses, and 3) restrictions currently applicable to leasing activity and oil and gas activity within the boundaries of a National Marine Sanctuary will be imposed on all OCS acreage included within the MNMS proposed expansion area.

The level of uncertainty associated with the analyses conducted demands that the level of impact is reported with a range of values. Low, mid and high case estimates are used to satisfy this demand.

Currently the MNMS is a single location sanctuary that covers a total area of approximately one square mile. NOAA's proposal to expand the boundaries of the sanctuary include three spatially delimited alternatives, each of which progressively increases the geographic extent of the sanctuary and, for Alternative 3, increases the number of sanctuary locations that do not share a common border.

Alternative 1 describes a proposal to expand the contiguous area of the MNMS from ~1 square mile to ~376 square miles (*Figure 1a*).

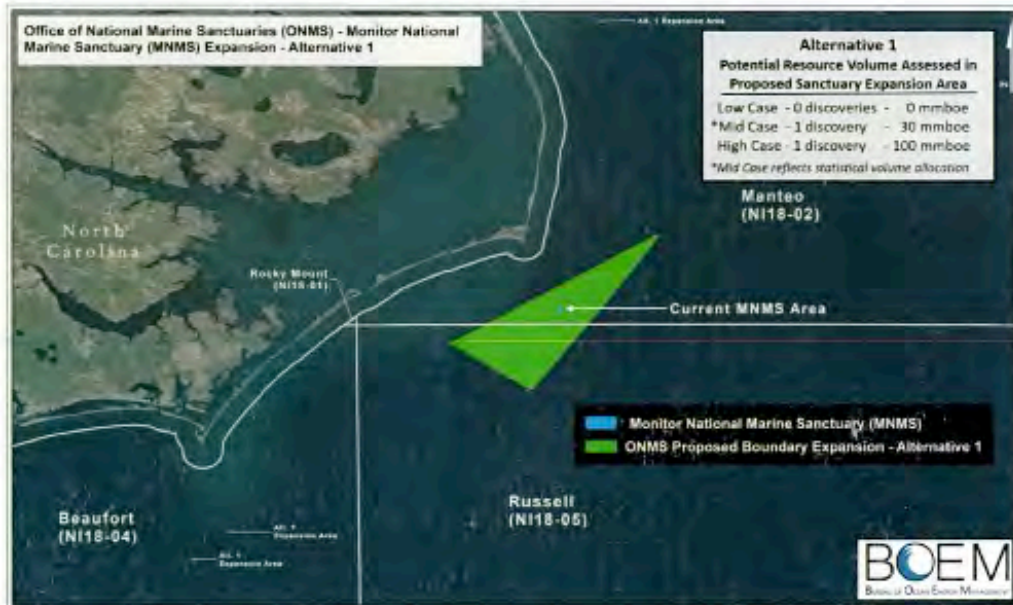


Figure 1a - Range of values, Alternative 1: risked volumes of undiscovered oil and gas resource potential that may exist within the proposed sanctuary expansion area

Alternative 2 describes a proposal to expand the contiguous area of the MNMS from ~1 square mile to ~1000 square miles (*Figure 1b*).

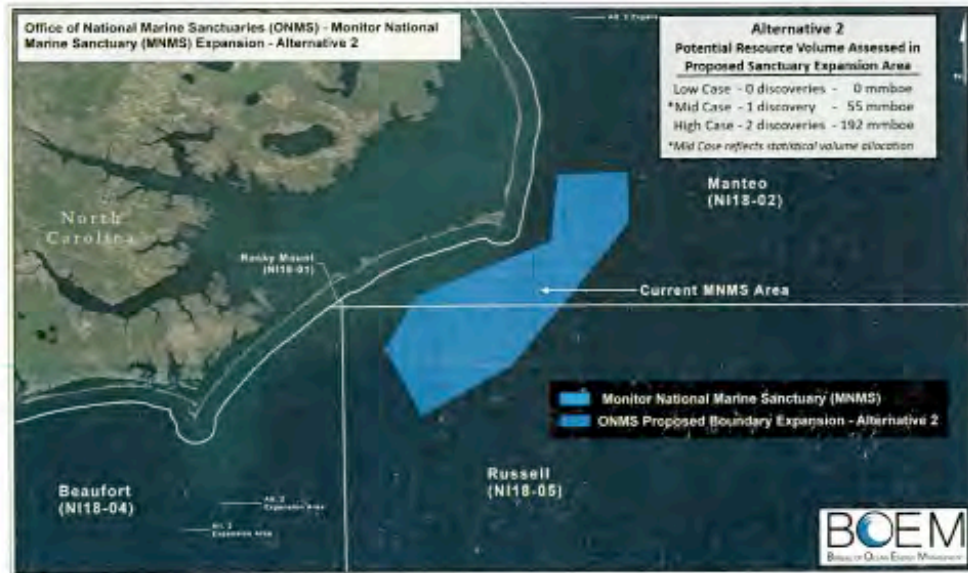


Figure 1b. Range of values, Alternative 2: risked volumes of undiscovered oil and gas resource potential that may exist within the proposed sanctuary expansion area

Alternative 3, NOAA's preferred alternative, is a proposal to increase both the number of contiguous area-locations of the sanctuary from 1 to 3 and increase the geographic area of the sanctuary from ~1 square mile to ~1365 square miles (*Figure 1c*).

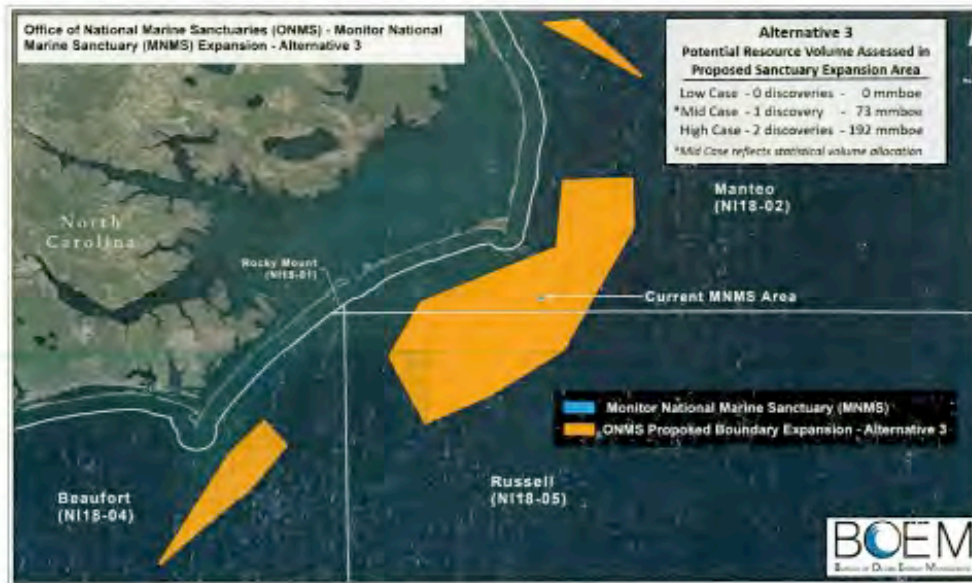


Figure 1c. Range of values, Alternative 3: risked volumes of undiscovered oil and gas resource potential that may exist within the proposed sanctuary expansion area

BOEM REVIEW OF POTENTIAL METHANE HYDRATES IMPACTS

BOEM has assessed the potential for methane hydrate resources in the proposed expansion area of MNMS. Due to the shallow water depth of the proposed expansion area, the formation of methane hydrate in the subsurface is unlikely. Therefore, BOEM finds that the mean volume of in-place and technically recoverable methane hydrate resources in the proposed expansion area to be zero. The potential impact on the development of methane hydrate resources in the area of the proposed expansion of MNMS will be negligible.

BOEM REVIEW OF POTENTIAL OFFSHORE MARINE MINERALS IMPACTS

BOEM's Marine Minerals Program (MMP) has preliminary data that indicate there are potential sand resources offshore of North Carolina in the proposed MNMS expansion area. NOAA has identified three Alternatives for expanding the Sanctuary, depicted in *Figures 2, 2a, 2b, 2c, 2d*. The Figures below also show "Atlantic Sand Aliquots" that have been identified by BOEM as containing potential sand resources from areas surveyed during the Atlantic Sand Assessment Project and compiled historical North Carolina Core Samples to identify new marine minerals resources.

As described in further detail below, BOEM is concerned that Alternatives 2 and 3 would negatively impact BOEM's ability to respond to offshore sand needs created by future coastal storm events, as dredging would not be permitted in MNMS.

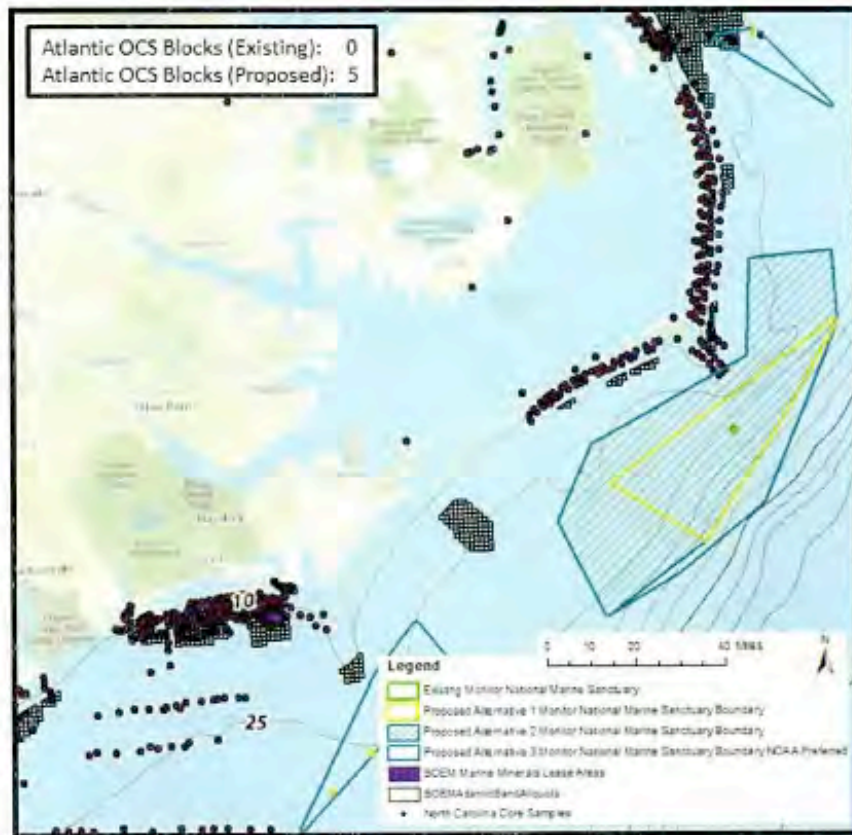


Figure 2 – All Expansion Alternatives

Proposed Alternative 1 (Figure 2a)

Proposed areas outlined in yellow on the map are greater than one mile from offshore sand resource areas depicted as BOEM Atlantic Sand Aliquots. BOEM's MMP believes that this alternative would have fewer negative impacts to the future use of OCS sand resources offshore North Carolina than the other two options under consideration.



Figure 2a - Expansion Alternative 1

Proposed Alternative 2 (Figure 2b)

Proposed areas outlined in teal blue hatch on the map are greater than one mile from identified offshore sand resource areas (BOEM Atlantic Sand Aliquots within Blocks 6912 and 6962). However, potential resources are currently being evaluated through BOEM's cooperative agreement with Eastern Carolina University in the vicinity of Cape Hatteras. Core samples are noted in purple dots. Because dredging would not be permitted in MNMS, BOEM is concerned that dredging in close proximity to the expanded Sanctuary may also be prohibited.

BOEM recommends that NOAA coordination with USACE Wilmington, USACE Charleston, and Dare County be made a high priority in order to ensure that this proposed expansion will not impede the use of OCS sand resources in the area.



Figure 2b - Expansion Alternative 2

Proposed Alternative 3 (NOAA Preferred) (Figures 2c and 2d)

BOEM's MMP has significant concerns with the proposed MNMS Alternative 3 boundary, as it has the potential to limit marine mineral activity in federal waters. *Figure 2c* depicts expired lease area OCS-A 0513 for Dare County. Proposed areas outlined in teal blue intersect with potential sand resource areas (BOEM Atlantic Sand Aliquots in Blocks 6015, 6063, 6064, 6912, 6962).

North Carolina suffers from continual erosion and regularly is in need of OCS sediment for beach nourishment. Mineral resources are currently being evaluated through BOEM's cooperative agreement with Eastern Carolina University in the vicinity of Cape Hatteras, Morehead City and Dare County. Core samples are noted in purple and the black blocks are areas identified as federal sand resources.

BOEM recommends NOAA coordination with USACE Wilmington, USACE Charleston, and respective North Carolina counties be made a high priority in order to ensure that this proposed expansion will not impede the use of critical OCS sediment resources in the area.



Figure 2c - Expansion Alternative 3 (NOAA Preferred)



Marine Minerals

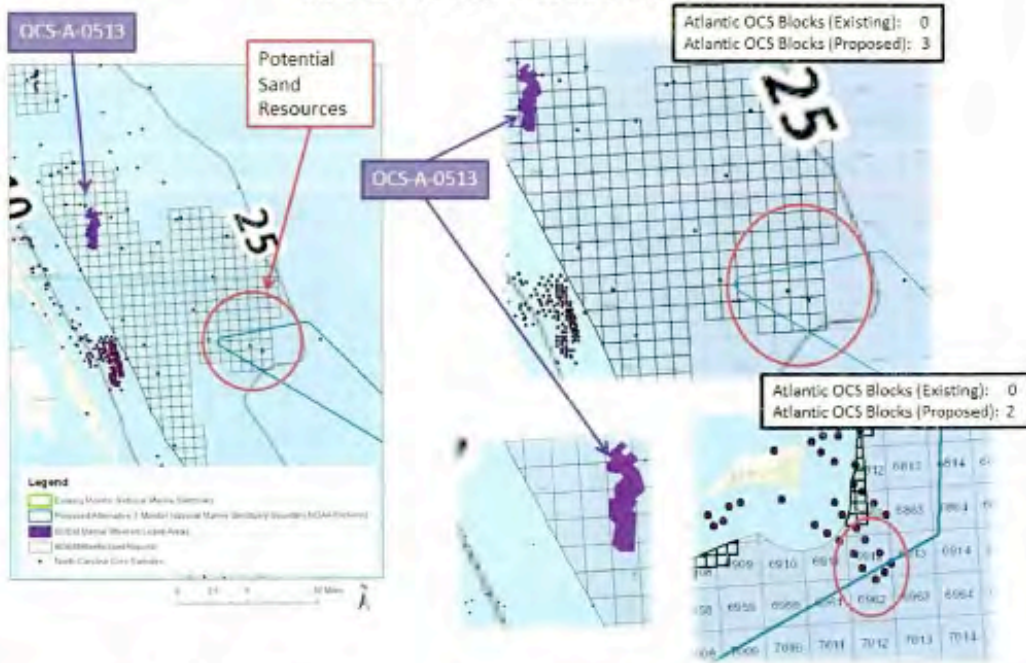
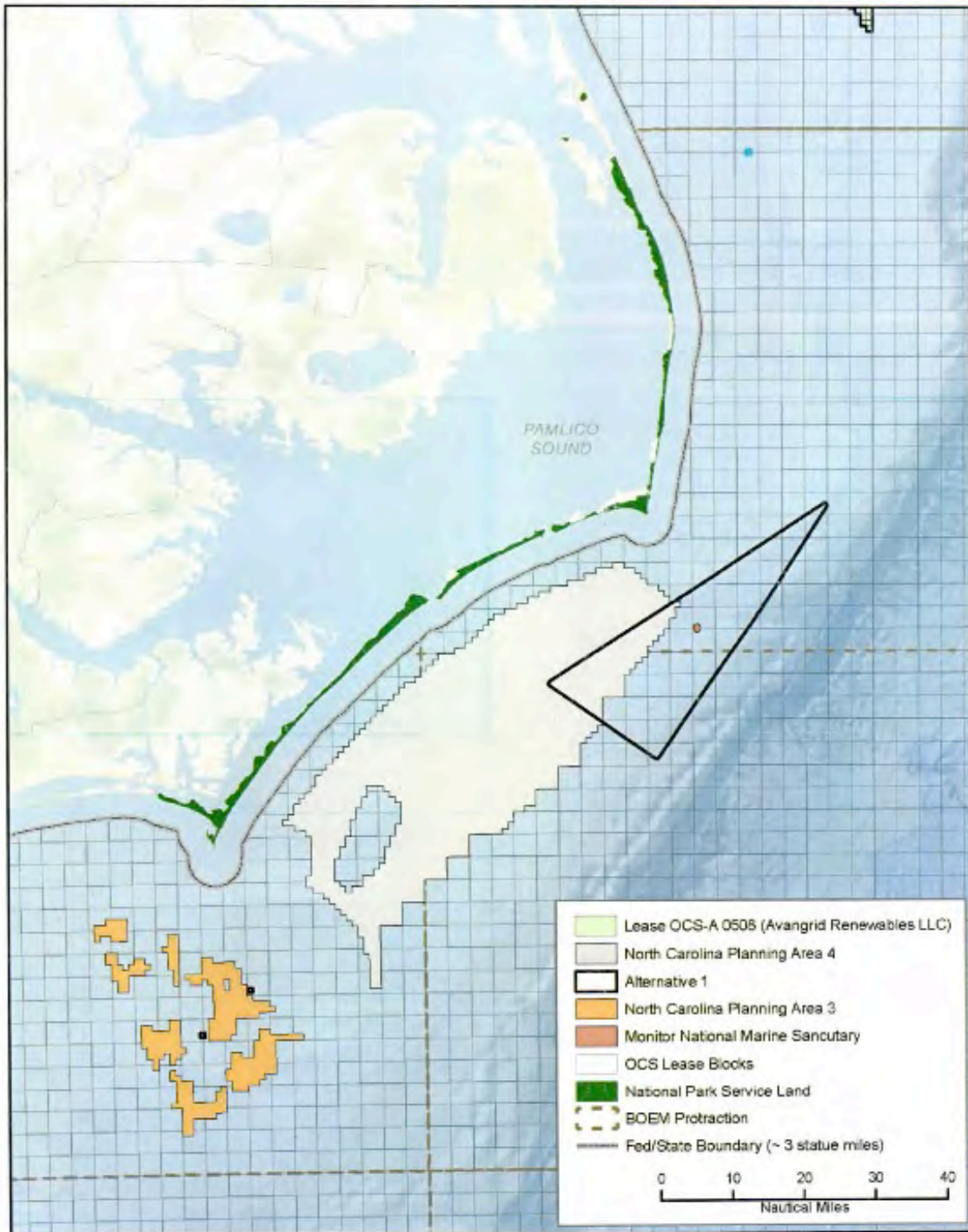
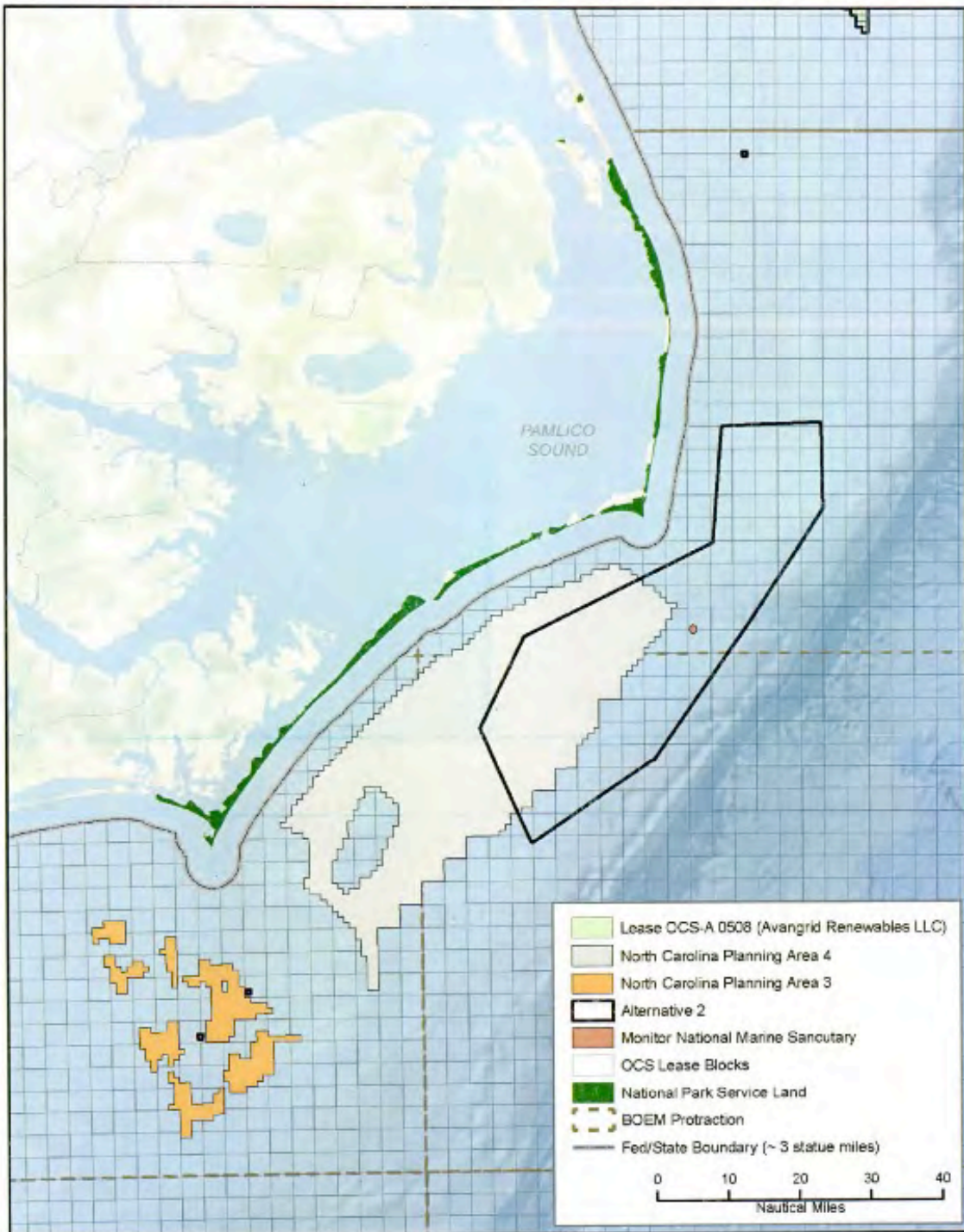


Figure 2d - Potential Sand Resources and Alternative 3 (NOAA Preferred)

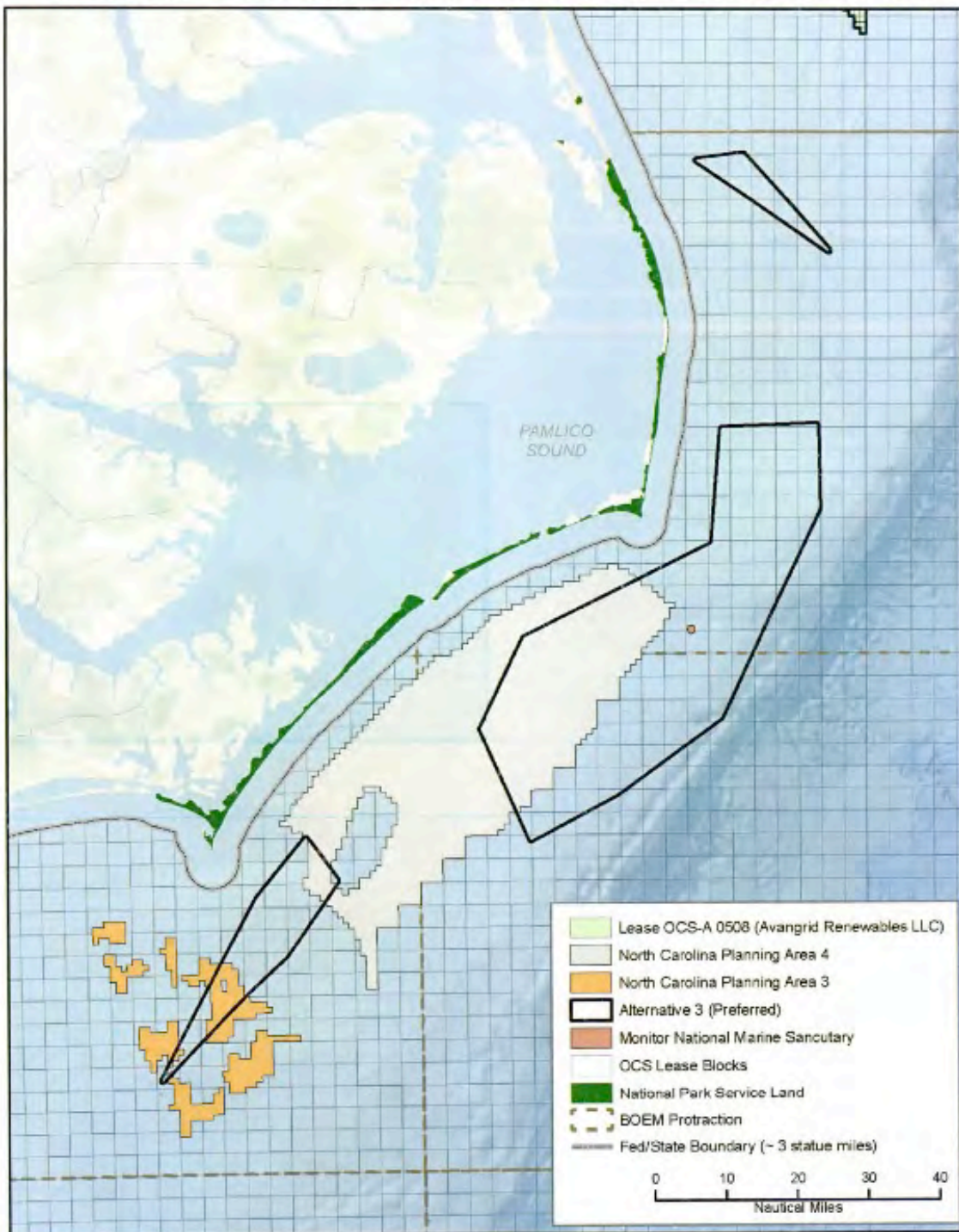
Attachment 1: Alternative 1 with North Carolina Planning Areas 3 & 4



Attachment 2: Alternative 2 with North Carolina Planning Areas 3 & 4



Attachment 3: Alternative 3 with North Carolina Planning Areas 3 & 4





United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Field Office
1339 20th Street
Vero Beach, FL 32960-3559
Phone: (772) 562-3909 Fax: (772) 562-4288
<http://fws.gov/verobeach>



In Reply Refer To:

June 03, 2019

Consultation Code: 04EF2000-2019-SLI-0820

Event Code: 04EF2000-2019-E-02470

Project Name: Florida Keys National Marine Sanctuary Revision

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (<http://www.fws.gov/windenergy/>) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm>; <http://www.towerkill.com>; and <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

South Florida Ecological Services Field Office
1339 20th Street
Vero Beach, FL 32960-3559
(772) 562-3909

06/03/2019

Event Code: 04EF2000-2019-E-02470

2

Project Summary

Consultation Code: 04EF2000-2019-SLI-0820

Event Code: 04EF2000-2019-E-02470

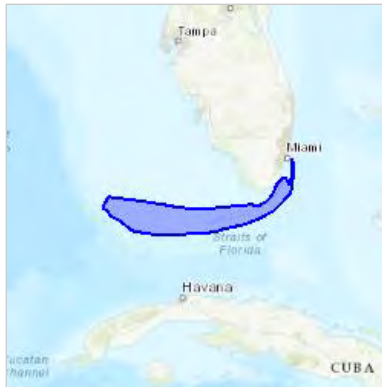
Project Name: Florida Keys National Marine Sanctuary Revision

Project Type: Regulation Promulgation

Project Description: Revision of sanctuary boundaries and regulations.

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/place/25.053650415685386N80.36260708993673W>



Counties: Miami-Dade, FL | Monroe, FL

Endangered Species Act Species

There is a total of 55 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

06/03/2019

Event Code: 04EF2000-2019-E-02470

4

Mammals

NAME	STATUS
Florida Bonneted Bat <i>Eumops floridanus</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8630	Endangered
Florida Panther <i>Puma (=Felis) concolor coryi</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1763 Habitat assessment guidelines: https://ecos.fws.gov/ipac/guideline/assessment/population/8/office/41420.pdf	Endangered
Key Deer <i>Odocoileus virginianus clavium</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6326	Endangered
Key Largo Cotton Mouse <i>Peromyscus gossypinus allapaticola</i> There is proposed critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/7246	Endangered
Key Largo Woodrat <i>Neotoma floridana smalli</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3921	Endangered
Lower Keys Marsh Rabbit <i>Sylvilagus palustris hefneri</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2658	Endangered
Puma (=mountain Lion) <i>Puma (=Felis) concolor (all subsp. except coryi)</i> Population: FL No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6049	Similarity of Appearance (Threatened)
Rice Rat <i>Oryzomys palustris natator</i> Population: lower FL Keys There is final critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6988	Endangered
West Indian Manatee <i>Trichechus manatus</i> There is final critical habitat for this species. Your location overlaps the critical habitat. <i>This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.</i> Species profile: https://ecos.fws.gov/ecp/species/4469	Threatened

06/03/2019

Event Code: 04EF2000-2019-E-02470

5

Birds

NAME	STATUS
Bachman's Warbler (=wood) <i>Vermivora bachmanii</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3232	Endangered
Cape Sable Seaside Sparrow <i>Ammodramus maritimus mirabilis</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6584	Endangered
Everglade Snail Kite <i>Rostrhamus sociabilis plumbeus</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7713 Species survey guidelines: https://ecos.fws.gov/ipac/guideline/survey/population/1221/office/41420.pdf	Endangered
Florida Grasshopper Sparrow <i>Ammodramus savannarum floridanus</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/32	Endangered
Florida Scrub-jay <i>Aphelocoma coerulescens</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6174	Threatened
Ivory-billed Woodpecker <i>Campephilus principalis</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8230	Endangered
Kirtland's Warbler <i>Setophaga kirtlandii</i> (= <i>Dendroica kirtlandii</i>) No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8078	Endangered
Piping Plover <i>Charadrius melodus</i> Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is final critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot <i>Calidris canutus rufa</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Red-cockaded Woodpecker <i>Picoides borealis</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7614	Endangered
Roseate Tern <i>Sterna dougallii dougallii</i> Population: Western Hemisphere except NE U.S.	Threatened

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NAME	STATUS
No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2083	
Wood Stork <i>Mycteria americana</i> Population: AL, FL, GA, MS, NC, SC No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8477 Habitat assessment guidelines: https://ecos.fws.gov/ipac/guideline/assessment/population/124/office/41420.pdf	Threatened

Reptiles

NAME	STATUS
American Alligator <i>Alligator mississippiensis</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/776	Similarity of Appearance (Threatened)
American Crocodile <i>Crocodylus acutus</i> Population: U.S.A. (FL) There is final critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6604	Threatened
Eastern Indigo Snake <i>Drymarchon corais couperi</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/646	Threatened
Hawksbill Sea Turtle <i>Eretmochelys imbricata</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Leatherback Sea Turtle <i>Dermochelys coriacea</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle <i>Caretta caretta</i> Population: Northwest Atlantic Ocean DPS There is final critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Fishes

NAME	STATUS
Atlantic Sturgeon (gulf Subspecies) <i>Acipenser oxyrinchus (=oxyrhynchus) desotoi</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/651	Threatened

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Snails

NAME	STATUS
Stock Island Tree Snail <i>Orthalicus reses</i> (<i>not incl. nesodryas</i>) No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/466	Threatened

Insects

NAME	STATUS
Bartram's Hairstreak Butterfly <i>Strymon acis bartrami</i> There is final critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/4837	Endangered
Florida Leafwing Butterfly <i>Anaea troglodyta floridalis</i> There is final critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6652	Endangered
Miami Blue Butterfly <i>Cyclargus</i> (= <i>Hemiargus</i>) <i>thomasi bethunebakeri</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3797	Endangered
Schaus Swallowtail Butterfly <i>Heracles aristodemus ponceanus</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1951	Endangered

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Flowering Plants

NAME	STATUS
Beach Jacquemontia <i>Jacquemontia reclinata</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1277	Endangered
Big Pine Partridge Pea <i>Chamaecrista lineata keyensis</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8416	Endangered
Blodgett's Silverbush <i>Argythamnia blodgettii</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6823	Threatened
Cape Sable Thoroughwort <i>Chromolaena frustrata</i> There is final critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/4733	Endangered
Carter's Mustard <i>Warea carteri</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5583	Endangered
Carter's Small-flowered Flax <i>Linum carteri carteri</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7208	Endangered
Crenulate Lead-plant <i>Amorpha crenulata</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6470	Endangered
Deltoid Spurge <i>Chamaesyce deltoidea ssp. deltoidea</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/199	Endangered
Everglades Bully <i>Sideroxylon reclinatum ssp. austrofloridense</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4735	Threatened
Florida Brickell-bush <i>Brickellia mosieri</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/956	Endangered
Florida Pineland Crabgrass <i>Digitaria pauciflora</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3728	Threatened
Florida Prairie-clover <i>Dalea carthagenensis floridana</i> No critical habitat has been designated for this species.	Endangered

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NAME	STATUS
Species profile: https://ecos.fws.gov/ecp/species/2300	
Florida Semaphore Cactus <i>Consolea corallicola</i> There is final critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/4356	Endangered
Garber's Spurge <i>Chamaesyce garberi</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8229	Threatened
Key Tree Cactus <i>Pilosocereus robinii</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2520	Endangered
Okeechobee Gourd <i>Cucurbita okeechobeensis ssp. okeechobeensis</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5999	Endangered
Pineland Sandmat <i>Chamaesyce deltoidea pinetorum</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1914	Threatened
Sand Flax <i>Linum arenicola</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4313	Endangered
Small's Milkpea <i>Galactia smallii</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3360	Endangered
Tiny Polygala <i>Polygala smallii</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/996	Endangered
Wedge Spurge <i>Chamaesyce deltoidea serpyllum</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/949	Endangered

Ferns and Allies

NAME	STATUS
Florida Bristle Fern <i>Trichomanes punctatum ssp. floridanum</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8739	Endangered

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Critical habitats

There are 9 critical habitats wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
American Crocodile <i>Crocodylus acutus</i> https://ecos.fws.gov/ecp/species/6604#crithab	Final
Bartram's Hairstreak Butterfly <i>Strymon acis bartrami</i> https://ecos.fws.gov/ecp/species/4837#crithab	Final
Cape Sable Thoroughwort <i>Chromolaena frustrata</i> https://ecos.fws.gov/ecp/species/4733#crithab	Final
Florida Leafwing Butterfly <i>Anaea troglodyta floralis</i> https://ecos.fws.gov/ecp/species/6652#crithab	Final
Florida Semaphore Cactus <i>Consolea corallicola</i> https://ecos.fws.gov/ecp/species/4356#crithab	Final
Loggerhead Sea Turtle <i>Caretta caretta</i> https://ecos.fws.gov/ecp/species/1110#crithab	Final
Piping Plover <i>Charadrius melodus</i> https://ecos.fws.gov/ecp/species/6039#crithab	Final
Rice Rat <i>Oryzomys palustris natator</i> https://ecos.fws.gov/ecp/species/6988#crithab	Final
West Indian Manatee <i>Trichechus manatus</i> https://ecos.fws.gov/ecp/species/4469#crithab	Final



AMERICA'S UNDERWATER TREASURES

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