National Park Service
U.S. Department of the Interior

Biscayne National Park
Florida

Biscayne National Park

Final General Management Plan /Environmental Impact Statement

Volume 1 of 2

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ABSTRACT

Final General Management Plan / Environmental Impact Statement
Biscayne National Park
Miami-Dade County, Florida

Biscayne National Monument was authorized by an act of Congress in 1968 (Public Law 90-606), expanded in 1974 (Public Law 93-477), and redesignated as a national park and expanded again in 1980 (Public Law 96-287). The last comprehensive management plan for the park was completed in 1983. Much has changed since 1983—the population near the park has greatly increased, visitor use patterns and types have changed, and people have brought new recreational activities into the park. Furthermore, studies since 1983 have enhanced the National Park Service's understanding of resources, resource threats, and visitor use in the national park. Each of these changes has implications for how resources are managed and protected, how visitors access and use the park, and how the National Park Service (NPS) manages its operations. This general management plan will provide updated management direction for the entire park for the next 15 to 20 years.

The National Park Service released a Draft General Management Plan / Environmental Impact Statement (2011 Draft Plan) to the public in August 2011. A key component of the agency-preferred alternative in the 2011 Draft Plan was inclusion of a marine reserve zone. The marine reserve zone was proposed as an area in the park where fishing of any kind would be prohibited, allowing a portion of the park's coral reef ecosystem to recover and offer visitors a high-quality visitor experience associated with a healthy, intact coral reef ecosystem. During the August 2011 public comment period, approximately 18,000 pieces of correspondence were received and more than 300 people attended three public meetings. A number of substantive comments were received that identified both positive and negative impacts related to the establishment of a marine reserve zone. In particular, individuals who fish, fishing and marine industry organizations, and the Florida Fish and Wildlife Conservation Commission (with whom the National Park Service consults regarding fishing management actions in the park) raised a number of significant issues about the NPS preferred alternative, including the marine reserve zone. The position of the State of Florida was that any consideration of a marine reserve zone could only occur after measurable management objectives have been clearly defined and less restrictive management measures have been appropriately implemented and evaluated in close coordination with other agencies and stakeholders.

Based on the comments received, the National Park Service undertook an evaluation process to consider a number of management actions that could be used to achieve the goal of a healthier coral reef ecosystem in the park to provide a more enjoyable and diverse visitor experience, while protecting the natural and cultural resources of the park. Thus, two additional alternatives (alternatives 6 and 7) were developed in consultation with the Florida Fish and Wildlife Conservation Commission and the National Oceanic and Atmospheric Administration, National Marine Fisheries Service, and presented in the 2013 Supplemental Draft General Management Plan / Environmental Impact Statement (2013 Supplemental Plan) for public consideration. Alternatives 6 and 7 contained many of the same elements as the original agency preferred alternative (alternative 4), except instead of including a marine reserve zone, the alternatives included a new concept referred to as a special recreation zone. Some other comments submitted for the 2011 Draft Plan resulted in minor changes to the text of the 2013 Supplemental Plan and are reflected in the *Final General Management Plan / Environmental Impact Statement*. Following release of the 2013 Supplemental Plan, approximately 14,000 pieces of correspondence were received containing 1,800 comments. Many comments focused on the special recreation zone, and specifically on alternative 6, including concerns regarding proposed fishing and anchoring restrictions, administration of the special activity license fishing permit system, and the adaptive management strategy. Based on the few comments received regarding alternative 7, numerous comments requesting further clarification and an opportunity for additional civic engagement, the National Park Service held three more public workshops in September 2014. A number of substantive comments were received regarding the overall permitting approach proposed in alternative 6, the effectiveness of the special recreation zone, the ability of the National Park Service to enforce this zone, and the effects of a larger special recreation zone compared to the size of a marine reserve zone.

The National Park Service considered public and agency comments and drafted alternative 8 (a hybrid of alternatives 4 and 6 and is the final NPS preferred alternative) to address some of those concerns. Presented here in this *Final General Management Plan / Environmental Impact Statement* is the final NPS preferred alternative

(alternative 8) as well as alternatives 2 through 5 from the 2011 Draft Plan and alternatives 6 and 7 from the 2013 Supplemental Plan. Alternative 1 (no action) consists of existing park management and trends and serves as a basis for comparison in evaluating the other alternatives. The concept for park management under alternative 2 would emphasize the recreational use of the park while providing resource protection as governed by law, policy, or resource sensitivity. This concept would be accomplished by providing a high level of services, facilities, and access to specific areas of the park. The concept for park management under alternative 3 would allow all visitors a full range of visitor experiences throughout most of the park and would use a permit system to authorize a limited number of visitors to access some areas of the park. Management actions would provide strong natural and cultural resource protection and diverse visitor experiences. Alternative 4 would emphasize strong natural and cultural resource protection while providing a diversity of visitor experiences. Some areas would be reserved for focused types of visitor use. A key component of this alternative was a marine reserve zone where fishing would be prohibited to enhance the quality and type of visitor experience and improve the condition of coral reefs by increasing the reef's resiliency to other impacts. The concept for park management under alternative 5 would promote the protection of natural resources, including taking actions to optimize conditions for protection and restoration. A permit system would be used in some parts of the park to provide specific experiences. Similar to alternative 4, alternatives 6 and 7 would emphasize strong natural and cultural resource protection while providing a diversity of visitor experiences. Alternatives 6 and 7 include a special recreation zone that would be managed as part of an adaptive management strategy to achieve the goal of a healthier coral reef ecosystem within the zone to provide a more enjoyable and diverse visitor experience, including fishing. The final NPS preferred alternative (alternative 8) would support strong natural and cultural resources protection while providing improved opportunities for quality visitor experiences. This alternative is a hybrid of alternatives 4 and 6 and combines the “no fishing” marine reserve zone with other management zones described in alternative 6. The eight alternatives are described in detail in chapter 2 and summarized in table 4 of that chapter. The key impacts of implementing each alternative are described in the following "Summary" section, detailed in chapter 4, and summarized in table 5 (chapter 2).

The key impacts of implementing the no-action alternative (alternative 1) would be a continuation of existing impacts on natural and cultural resources, visitor experience, and park operations; including adverse effects on fisheries and some federally listed threatened and endangered species. The key impacts of implementing alternative 2 would be negligible to moderate adverse impacts on natural resources, no adverse effect on cultural resources, mostly beneficial visitor experience impacts, adverse park operations impacts, and beneficial economic impacts. The key impacts of implementing alternative 3 would be approximately the same as for alternative 2. The key impacts of implementing alternative 4 would be beneficial for natural resources, no adverse effects on cultural resources, beneficial and adverse impacts on visitor experience, adverse impacts on park operations, and beneficial and adverse impacts on the local economy. The key impacts of implementing alternative 5 would be beneficial for natural resources, no adverse effect on cultural resources, beneficial and adverse impacts on visitor experience, adverse impacts on park operations, and both beneficial and adverse impacts on the local economy. Alternatives 6 and 7 have similar impacts, but many of the adverse impacts on fisheries, submerged aquatic communities, and listed species would be reduced due to zoning changes including the provisions of the special recreation zone. Alternatives 6 and 7 would also have both beneficial and adverse impacts on visitor experience and adverse impacts on park operations. Alternative 8 would have beneficial impacts on natural resources, no adverse effects on cultural resources, beneficial and adverse impacts on visitor experience, adverse impacts on park operations, and beneficial and adverse impacts on the local economy.

This *Final Draft General Management Plan / Environmental Impact Statement* has been distributed to other agencies and interested organizations and individuals. After a 30-day period, a Record of Decision may be prepared for the signature of the regional director.

SUMMARY

Biscayne National Monument was established in 1968 (Public Law 90-606), expanded in 1974 (Public Law 93-477), and redesignated as a national park and expanded again in 1980 (Public Law 96-287).

The last comprehensive planning effort (general management plan) for Biscayne National Park was completed in 1983. Much has occurred since 1983—the population near the park has greatly increased, visitor use patterns and types have changed, and people want to bring new recreational activities into the park. Each of these changes has major implications for how visitors access and use the park and the facilities needed to support those uses, how resources are managed, and how the National Park Service (NPS) manages its operations. A new plan is needed to

- clearly define resource conditions and visitor experiences to be achieved in Biscayne National Park
- provide a framework for NPS managers to use when making decisions about how to best protect national park resources, how to provide a diverse range of visitor experience opportunities, how to manage visitor use, and what kinds of facilities, if any, to develop in the park
- ensure that this foundation for decision making has been developed in consultation with interested stakeholders and adopted by NPS leadership after an adequate analysis of the benefits, impacts, and economic costs of alternative courses of action

The National Park Service released the *Draft General Management Plan / Environmental Impact Statement* (2011 Draft Plan) to the public in August 2011. A key component of the agency-preferred alternative in the 2011 Draft Plan was inclusion of a marine reserve zone. The marine reserve zone was proposed as an area in the park where fishing of any kind would be prohibited to allow a portion of the park's coral reef ecosystem to recover and to offer visitors a high-quality visitor experience associated with a healthy, intact coral reef ecosystem.

During the August 2011 public comment period, approximately 18,000 pieces of correspondence were received and more than 300 people attended three public meetings. A number of correspondences contained substantive comments that identified both positive and negative impacts related to the establishment of a marine reserve zone. In particular, individuals who fish, fishing and marine industry organizations, and the Florida Fish and Wildlife Conservation Commission (with whom the National Park Service consults regarding fishing management actions in the park) raised a number of significant issues about the NPS preferred alternative, including the marine reserve zone. The position of the State of Florida was that any consideration of a marine reserve zone could only occur after measurable management objectives have been clearly defined and less restrictive management measures have been appropriately implemented and evaluated in close coordination with other agencies and stakeholders.

Based on comments received, the National Park Service undertook an evaluation process to consider a number of management actions that could be enacted to achieve the goal of a healthier coral reef ecosystem within the marine reserve zone to provide a more enjoyable and diverse visitor experience, while protecting the natural and cultural resources of the park. Thus, two additional alternatives (alternatives 6 and 7) were developed in consultation with the Florida Fish and Wildlife Conservation Commission and the National Oceanic and Atmospheric Administration, National Marine Fisheries Service, and

presented in the 2013 *Supplemental Draft General Management Plan / Environmental Impact Statement* (2013 Supplemental Plan) for public comment. Alternatives 6 and 7 contained many of the same elements as the original agency preferred alternative (alternative 4), except instead of including a marine reserve zone, the alternatives included a new concept referred to as a special recreation zone. Some other comments submitted for the 2011 Draft Plan resulted in minor changes to the text of the 2013 Supplemental Plan that are reflected in the *Final General Management Plan / Environmental Impact Statement*.

Following release of the 2013 Supplemental Plan, approximately 14,000 pieces of correspondence were received containing 1,800 different comments. Many comments focused on the special recreation zone, and specifically on alternative 6, including concerns regarding proposed fishing and anchoring restrictions, administration of the special activity license fishing permit system, and the adaptive management strategy. Based on the few comments received regarding alternative 7, numerous comments requesting further clarification and a chance for additional civic engagement, the National Park Service held three more public workshops in September 2014. A number of substantive comments were received regarding the overall permitting approach proposed in alternative 6, effectiveness of the special recreation zone, NPS ability to enforce this zone, and the effects of a larger special recreation zone compared to the size of a marine reserve zone.

The National Park Service considered public and agency comments and drafted alternative 8 (a hybrid of alternatives 4 and 6 that is the final NPS preferred alternative to address some of those concerns. The *Final General Management Plan / Environmental Impact Statement* presents the final NPS preferred alternative (alternative 8), as well as alternatives 2 through 5 from the 2011 Draft Plan and alternatives 6 and 7 from the 2013 Supplemental Plan. The alternatives, which are based on the national park's purpose, significance, and special mandates, present different ways to manage resources and visitor use and improve facilities and infrastructure at Biscayne National Park.

ALTERNATIVE 1 (THE NO-ACTION ALTERNATIVE)

The no-action alternative consists of a continuation of existing management and trends at Biscayne National Park and provides a baseline for comparison in evaluating the changes and impacts of the other alternatives. The National Park Service would continue to manage the national park as it is currently being managed. Existing operations and visitor facilities would continue, and no new construction would be authorized other than what has already been approved and funded. Current law, policy, and plans would continue to provide the framework of guidance.

The key impacts of continuing existing management conditions and trends would be a continuation of existing impacts on natural and cultural resources, visitor experience, and park operations; including adverse effects on fisheries and some federally listed threatened and endangered species and no new impacts on the socioeconomic environment.

ALTERNATIVE 2

The concept for park management under alternative 2 would be to emphasize the recreational use of the park while providing resource protection as governed by law, policy, or resource sensitivity. This concept would be accomplished by providing a high level of services, facilities, and access to specific areas of the park.

The key impacts of implementing alternative 2 would be as follows:

- beneficial impacts on fisheries and submerged aquatic communities
- not likely to adversely affect federally listed species
- negligible to minor adverse impacts on state listed species and wetlands

- no adverse effect on archeological resources, historic structures, or cultural landscapes
- both beneficial and adverse effects on visitor use and experience
- adverse impacts on the park's operations budget and beneficial impacts on park facilities
- beneficial impacts on the socioeconomic environment

ALTERNATIVE 3

The concept for park management under alternative 3 would be to allow all visitors a full range of visitor experiences throughout most of the park and would use a permit system to authorize a limited number of visitors to access some areas of the park. This alternative includes a "no fishing" marine reserve zone. Management actions would provide strong natural and cultural resource protection and diverse visitor experiences.

The important impacts of implementing alternative 3 would be as follows:

- beneficial impacts on fisheries and submerged aquatic communities
- not likely to adversely affect federally listed species
- negligible to minor adverse impacts on state listed species and wetlands
- no adverse effect on archeological resources, historic structures, or cultural landscapes
- both beneficial and moderate adverse effects on visitor use and experience
- adverse impacts on the park's operations budget and beneficial impacts on park facilities
- beneficial impacts on the socioeconomic environment

ALTERNATIVE 4

Alternative 4 would emphasize strong natural and cultural resource protection while providing a diversity of visitor experiences. Some areas would be reserved for limited types of visitor use. This alternative includes a "no fishing" marine reserve zone.

The key impacts of implementing alternative 4 would be as follows:

- beneficial impacts on fisheries and submerged aquatic communities
- not likely to adversely affect federally listed species
- negligible to minor adverse impacts on state listed species and wetlands
- no adverse effect on archeological resources, historic structures, or cultural landscapes
- both beneficial and adverse effects on visitor use and experience
- minor adverse impacts on park operations
- beneficial and adverse impacts on the socioeconomic environment

ALTERNATIVE 5

The concept for park management under alternative 5 would be to promote the protection of natural resources, including taking actions to optimize conditions for protection and restoration. A permit system would be used in some parts of the park. This alternative includes a "no fishing" marine reserve zone and other areas would have limited numbers of visitors, manner of access, and recreational activities to provide certain experiences.

The important impacts of implementing alternative 5 would be as follows:

- beneficial impacts on fisheries and submerged aquatic communities

- not likely to adversely affect federally listed species
- negligible adverse impacts on state listed species and wetlands
- no adverse effect on archeological resources, historic structures, or cultural landscapes
- both beneficial and adverse effects on visitor use and experience
- minor to moderate adverse impacts on park operations
- beneficial and adverse impacts on the socioeconomic environment

ALTERNATIVE 6

This alternative would emphasize strong natural and cultural resource protection while providing a diversity of visitor experiences. Visitor opportunities in this alternative would range from the challenges of exploring the natural environment alone to the convenience of built surroundings. A limited amount of moderate resource impacts would be tolerated in high-use areas of the park. Some visitor activities would be restricted in certain areas to protect sensitive resources and allow wildlife a respite from human contact. Other areas, such as the Legare Anchorage, would be reserved for limited types of visitor use.

As part of an adaptive management strategy, this alternative includes a special recreation zone that accommodates some recreational fishing while meeting the goal of providing a healthy coral reef ecosystem for a more enjoyable and diverse visitor experience.

The key impacts of implementing alternative 6 would be as follows:

- existing adverse impacts on fisheries, coral reefs, submerged cultural resources, and identified listed species would persist in much of the park due to impacts associated with boating, fishing, and marine debris
- some of these impacts would be reduced and there would be additional beneficial impacts in the special recreation zone and in other areas with protective zoning
- not likely to adversely affect federally listed species
- negligible to minor adverse impacts on state listed species and wetlands
- no adverse effect on archeological resources, historic structures, or cultural landscapes
- both beneficial and adverse effects on visitor use and experience
- minor adverse impacts on park operations
- beneficial and adverse impacts on the socioeconomic environment

ALTERNATIVE 7

Like alternative 6, this alternative would emphasize strong natural and cultural resource protection while providing a diversity of visitor experiences. This alternative includes fishing limitations such as a seasonal fishing closure that accommodates some recreational fishing while meeting the goal of providing a healthy coral reef ecosystem for a more enjoyable and diverse visitor experience.

Similar to alternative 6, the key impacts of implementing alternative 7 would be as follows:

- existing adverse impacts on fisheries, coral reefs, submerged cultural resources, and identified listed species would persist in much of the park due to impacts associated with boating, fishing, and marine debris
- some of these impacts would be reduced and there would be additional beneficial impacts in the special recreation zone and in other areas with protective zoning
- not likely to adversely affect federally listed species

- negligible to minor adverse impacts on state listed species and wetlands
- no adverse effect on archeological resources, historic structures, or cultural landscapes
- both beneficial and adverse effects on visitor use and experience
- minor adverse impacts on park operations
- beneficial and adverse impacts on the socioeconomic environment

- negligible to minor adverse impacts on state listed species and wetlands
- no adverse effect on archeological resources, historic structures, or cultural landscapes
- both beneficial and adverse effects on visitor use and experience
- minor adverse impacts on park operations
- beneficial and adverse impacts on the socioeconomic environment

ALTERNATIVE 8

This alternative is a hybrid of alternatives 4 and 6, which combines the "no fishing" marine reserve zone in alternative 4 with other management zones described in alternative 6. Alternative 8 emphasizes strong natural and cultural resource protection while providing a diversity of visitor experiences.

The key impacts of implementing alternative 8 would be as follows:

- beneficial impacts on fisheries and submerged aquatic communities
- not likely to adversely affect federally listed species

THE NEXT STEPS

Following distribution of the *Final General Management Plan / Environmental Impact Statement* and a 30-day no-action period, a Record of Decision can be prepared for the signature of the NPS regional director of the Southeast Region. The Record of Decision will document the NPS selection of an alternative for implementation and provide impairment findings. With the signed "Record of Decision," the plan can then be implemented, depending on funding and staffing. (An approved plan does not guarantee that funds and staff for implementing the plan will become available.)

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CHAPTER 1
Introduction

A GUIDE TO THIS DOCUMENT

This *Final General Management Plan / Environmental Impact Statement* is the completed management plan for Biscayne National Park. It incorporates elements of the 2011 *Draft General Management Plan / Environmental Impact Statement* (2011 Draft Plan) as well as the 2013 *Supplemental Draft General Management Plan / Environmental Impact Statement* (2013 Supplemental Plan) and revisions in response to public and agency comments regarding those drafts.

This document is organized in accordance with the Council on Environmental Quality (CEQ) implementing regulations for the National Environmental Policy Act of 1969, as amended (NEPA), National Park Service (NPS) *Management Policies 2006*, and NPS Director's Order 12: *Conservation Planning, Environmental Impact Analysis, and Decision-making*.

Chapter 1: Introduction sets the framework for the entire document. It describes why the plan is being prepared and what needs it must address. It offers guidance for the alternatives that are being considered, which are based on the park's purpose and the significance of its resources, special mandates and administrative commitments, servicewide mandates and policies, and other planning efforts in the area.

The chapter also details the planning opportunities and issues that were raised during public scoping meetings and initial planning team efforts; the alternatives in the next chapter address these issues and concerns to varying degrees. This chapter concludes with a statement of the scope of the environmental impact analysis—specifically what impact topics were or were not analyzed in detail.

Chapter 2: Alternatives, Including the Preferred Alternative begins by describing the management zoning that would be used to manage the park in the future. It also presents the continuation of current management and trends in the park—alternative 1 (the no-action alternative) and the "action" alternatives 2, 3, 4, 5, 6, 7, and 8 (a hybrid of alternatives 4 and 6 and the final NPS preferred alternative). There is a brief discussion of alternatives or actions that were dismissed from detailed analysis. The mitigation measures proposed to minimize or eliminate the impacts of some proposed actions are described just before the discussion of future studies and/or implementation plans that would be needed. The cost estimates and an evaluation of the environmentally preferable alternative are followed by summary tables of the alternative actions and the environmental consequences of implementing those alternative actions (which are based on information in chapter 4).

Chapter 3: Affected Environment describes those areas and resources that would be affected by implementing actions in the various alternatives—natural resources, cultural resources, visitor experience, park operations, and socioeconomic environment.

Chapter 4: Environmental Consequences analyzes the impacts of implementing the alternatives on topics described in the "Affected Environment" chapter. Methods that were used for assessing the impacts in terms of intensity, duration, and type of impacts are outlined at the beginning of the chapter.

Chapter 5: Consultation and Coordination describes the history of public and agency coordination during the planning effort and any future compliance requirements. It also lists agencies and organizations that will be receiving copies of the document.

The **Appendixes** present supporting information for the document along with references, a list of the planning team and other consultants, and an index.

PURPOSE OF AND NEED FOR THE PLAN

INTRODUCTION

This *Final General Management Plan / Environmental Impact Statement* presents and analyzes eight alternative future directions for the management and use of Biscayne National Park, including alternative 1 (the no-action alternative) and alternatives 2 through 8 (action alternatives). The potential environmental impacts of implementing each alternative have been identified and assessed in this document in "Chapter 4: Environmental Consequences."

General management plans (GMP) are intended to be long-term documents that establish and articulate a management philosophy and framework for decision making and problem solving in national park system units. General management plans usually provide guidance during a 15- to 20-year period. The general management plan considers the park in its full ecological and cultural contexts—as a unit of the national park system and as part of the surrounding ecosystem and region. The connections among various programs and management zones in the park are identified as a method of looking at the park holistically and fully considering the broader implications of specific decisions.

Actions directed by general management plans or in subsequent implementation plans are accomplished over time, which may be many years into the future when dealing with time frames of natural and cultural processes. Budget restrictions, requirements for additional data or regulatory compliance, and competing national park system priorities may prevent immediate implementation of many actions. Major or especially costly actions could be implemented 10 or more years into the future.

PLANNING BACKGROUND

The 2011 Draft Plan was released to the public in August 2011 and reflected agency and stakeholder engagement throughout the entire GMP process. The National Park Service conducted public scoping meetings and workshops (in 2001, 2003, and 2009) and held three public meetings on the 2011 Draft Plan in 2011. A key component of the agency-preferred alternative in the 2011 Draft Plan was inclusion of a marine reserve zone. The marine reserve zone was proposed as an area in the park where fishing of any kind would be prohibited to allow a portion of the coral reef system to recover and offer visitors a high-quality visitor experience associated with a healthy, intact coral reef system.

During the public comment period in 2011, approximately 18,000 public comments were received and more than 300 people attended three public meetings. Most comments were related to fishing, and in particular, the marine reserve zone. A number of substantive comments were received that identified both positive and negative impacts related to the establishment of the marine reserve zone. In particular, individuals who fish, fishing and marine industry organizations, and the Florida Fish and Wildlife Conservation Commission (FWC) with whom the National Park Service consults regarding fishing management actions in the park, raised a number of significant issues about the NPS preferred alternative, including the marine reserve zone. The position of the State of Florida was that any consideration of a marine reserve zone could only occur after measurable management objectives have been clearly defined and less restrictive management measures have been appropriately implemented and evaluated in close coordination with other agencies and stakeholders.

Based on the comments received, the National Park Service undertook an evaluation process to consider a number of management actions that could be enacted to achieve the goal of a healthier coral reef ecosystem within the marine reserve zone to provide a more enjoyable and diverse visitor experience, while protecting the natural and cultural resources of Biscayne National Park. Thus, two additional alternatives (alternatives 6 and 7) were developed in consultation with the FWC and the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) and presented in the 2013 Supplemental Plan for public consideration. Alternatives 6 and 7 contained many of the same elements as the original agency preferred alternative (alternative 4), except that instead of including a marine reserve zone, the alternatives included a new concept referred to as a special recreation zone. Some other comments submitted for the 2011 Draft Plan resulted in minor changes to the text of the 2013 Supplemental Plan and are reflected in the *Final General Management Plan / Environmental Impact Statement*.

Following release of the 2013 Supplemental Plan, approximately 14,000 pieces of correspondence were received containing 1,800 comments. Many comments focused on the special recreation zone, and specifically on alternative 6, including concerns regarding proposed fishing and anchoring restrictions, administration of the special activity license fishing permit system, and the adaptive management strategy. Based on the few comments received regarding alternative 7, numerous comments requesting further clarification and a chance for additional civic engagement, the National Park Service held three public workshops in September 2014. A number of substantive comments were received regarding the overall permitting approach proposed in alternative 6, effectiveness of the special recreation zone, the ability of the National Park Service to enforce this zone, and the effects of a larger special recreation zone compared to the size of a marine reserve zone.

The National Park Service considered public and agency comments and drafted alternative 8 (a hybrid of alternatives 4 and 6 and the final NPS preferred alternative) to address some of those concerns. Presented here in this *Final General Management Plan / Environmental Impact Statement* is the final NPS preferred alternative (alternative 8). The original alternatives 2 through 5 from the 2011 Draft Plan, as well as alternatives 6 and 7 from the 2013 Supplemental Plan are also included.

BRIEF DESCRIPTION OF THE PARK

Biscayne National Monument was established by Public Law 90-606 in 1968, expanded by Public Law 93-477 in 1974, and expanded again and redesignation of the monument as a national park by Public Law 96-287 in 1980 (see appendix A). The park currently encompasses approximately 173,900 acres (270 square miles or 702 square kilometers), with park visitation figures of 486,848 in 2013.

The park is south of Miami, in Miami-Dade County, Florida. The northern boundary of the park is near the southern tip of Key Biscayne, and the park's southern boundary (about 22 miles to the south) is near Key Largo. The western boundary consists of natural areas intersected by some canals, marinas, and the park's administrative area and visitor center. The natural areas include red mangrove forests and coastal marshes. The eastern boundary extends out to sea about 14 miles to the east and is defined by the contiguous 60-foot (10 fathoms) depth contour.

Biscayne National Park is a marine park consisting of mostly submerged land and includes coral reefs, sandy shoals, 4,825 acres of largely undeveloped mangrove shoreline, and 42 keys or islands primarily composed of limestone and coral. Emergent land represents only 5% of the total area within the park boundary. The relatively shallow waters of Biscayne Bay average 6 feet in depth with several shallow banks. The deeper, more turbulent waters of Hawk Channel and the

reef tract are found in the Atlantic Ocean east of Biscayne Bay and the coral keys that make up the divide between the bay and the ocean. From north to south, the major keys in Biscayne National Park include Soldier Key, Ragged Keys, Boca Chita Key, Sands Key, Elliott Key, Adams Key, Rubicon Keys, Totten Key, Old Rhodes Key, Swan Key, and the Arsenicker Keys. The only road access to the park visitor center at Convoy Point is via southwest 328th Street (North Canal Drive) near Homestead, Florida.

Biscayne National Park is recognized for its natural resources, which represent a complex combination of terrestrial, marine, and amphibious wildlife species in a subtropical setting of great natural beauty. In general, the park can be divided into four prominent environments: (1) terrestrial mangrove shorelines, (2) shallow estuarine system (Biscayne Bay) with diverse bottom communities, (3) barrier island keys, and (4) a chain of coral reefs. The coral reefs (also called the reef platform) of Biscayne National Park lie due east of the keys and are part of the Florida Reef Tract that stretches through the park and beyond about 200 miles to the southwest. Much of the northern part of the Florida Reef Tract is in the park and comprises the northernmost extension of living coral reefs in the United States. Most of the shallow, protected waters of Biscayne Bay contain the estuarine environment of the park, which supports seagrasses and hardbottom communities.

Natural history indicates that Biscayne Bay has not always been saltwater. During earlier geologic periods of lower sea levels, most of what now comprises the bay was land or a combination of land and freshwater marshes. The terrestrial environment is represented by the narrow fringe of mangrove shoreline along the park's western boundary and the keys, which form a natural north-south barrier between Biscayne Bay and the coral reef platform. The keys contain various habitats including groups of hardwood trees known as hammocks, mangrove wetlands, sandy beaches, and rocky intertidal areas.

Biscayne National Park has a rich history of aboriginal occupation and use, Spanish exploration, pirates, smuggling, shipwrecks, marine salvaging, agriculture, and recreational development, which reflects the continual link between humans and the sea that characterizes this area for the past 10,000 years. Remnants of this cultural history occur throughout the park and are represented by both terrestrial and submerged cultural resources. Terrestrial cultural resources include American Indian occupation sites as well as historic structures, ruins, homesteads, and farmsteads. Submerged and shoreline cultural resources include materials associated with prehistoric sites as well as historic shipwrecks, ship strandings, wharfs and piers, and the remains of other structures and materials along the water's edge. Because of the park's natural history of rising sea levels, former terrestrial sites (possibly early prehistoric ones) may now be under water.

The primary means of access to the park is by private boat or concession-operated boats. Visitors come to the area for recreational opportunities including snorkeling, scuba diving, paddling, bird-watching, nature viewing, boating, and recreational fishing.

Land uses adjacent to the park's western boundary include agricultural fields interspersed with residential and recreational development. The facilities of Florida Power & Light Company at the Turkey Point Power Plant and the Miami-Dade County solid waste landfill are visible near the Dante Fascell Visitor Center at Convoy Point. Two public marinas operated by Miami-Dade County Parks, Recreation and Open Spaces Department at Black Point and Homestead Bayfront are adjacent to park boundaries and provide public access to the marine portions of the park. The urban Miami skyline is visible from the park headquarters building at Convoy Point.

PURPOSE OF THE PLAN

The approved general management plan will be the basic document for managing Biscayne National Park for the next 15 to 20 years. The purposes of this general management plan are as follows:

- Confirm the purpose, significance, and special mandates of Biscayne National Park.
- Clearly define resource conditions and visitor uses and experiences to be achieved in the park.
- Provide a framework for park managers to use when making decisions about how to best protect park resources; how to provide quality visitor uses and experiences; how to manage visitor use; and what kinds of facilities, if any, to develop in or near the park.
- Ensure that this foundation for decision making has been developed in consultation with interested stakeholders and adopted by NPS leadership after an adequate analysis of the benefits, impacts, and economic costs of alternative courses of action.

Legislation establishing the National Park Service as an agency and governing its management provides the fundamental direction for the administration of Biscayne National Park (and other units and programs of the national park system). This general management plan will build on these laws and the legislation that established Biscayne National Park to provide a vision for the park's future. The "Servicewide Mandates and Policies" section calls attention to topics that are important to understanding the management direction at the park. Appendix B gives more detail on the law or policy directing management actions. The alternatives in this general management plan address the desired conditions that are not mandated by law and policy and must be originated through a planning process.

NEED FOR THE PLAN

Biscayne National Park is currently operating under a Government Performance and Results Act Strategic Plan (2005) and a 1983 General Management Plan. A new general management plan for Biscayne National Park is needed because of the many changes that have occurred since 1983—the population near the park has greatly increased and visitor use patterns, types, and recreational interests have changed—each of which has major implications. The park's 1983 General Management Plan needs to be updated to reflect current values and strategies for making management decisions regarding natural and cultural resources and visitor experience.

Primary components of a general management plan are needed to meet the requirements of the National Parks and Recreation Act of 1978 and NPS policy, which mandate development of a general management plan for each unit in the national park system.

In the National Park Service, general management plans have a life of 15 to 20 years. The 1983 General Management Plan contained conflicting goals. For example, it mandated that the park would enforce Florida fishing laws, but also would sustain native marine populations as they existed prior to increased fishing restrictions. Subsequent planning since 1983 has refined these goals and re-established management priorities after consideration of recent visitation trends and updated resource condition data.

General management plans are high-level general plans, but do not preclude the park from developing other plans that would more specifically address these resource topics and actively engage other agencies. Day-to-day park operations also address the details of activities such as resource management, education, outreach, and law enforcement, which are not included in the general management plan.

NEXT STEPS AND IMPLEMENTATION OF THE PLAN

Following distribution of this *Final General Management Plan / Environmental Impact Statement* and a 30-day no-action period, a Record of Decision approving a final plan may be prepared for the signature of the director of the NPS Southeast Region. The Record of Decision will document the final selection of an alternative, which will then be implemented by the National Park Service.

Implementation of the approved plan would depend on future funding. The approval of a plan does not guarantee that the funding and staffing needed to implement the plan would be forthcoming. Full implementation of the approved plan could be many years in the future.

Implementation of the approved plan also could be affected by other factors. Once the general management plan has been approved, additional required feasibility studies and more detailed planning and environmental documentation would be completed before any proposed actions could be applied, as follows:

- Appropriate permits would be obtained before implementing actions that would impact wetlands.
- Appropriate federal and state agencies would be consulted concerning actions that could affect threatened and endangered species.
- American Indian tribes and the state historic preservation office would be consulted.

The general management plan does not describe how particular programs or projects should be prioritized or implemented. Those decisions would be addressed during the more detailed planning associated with strategic plans, implementation plans, etc. All those future, more-detailed plans would tier from the approved general management plan and would be based on the goals, future conditions, and appropriate types of activities established in the approved general management plan. Future plans will follow NPS planning guidelines.

GUIDANCE FOR THE PLANNING EFFORT

PURPOSE AND SIGNIFICANCE OF THE PARK

Purpose

Purpose statements are based on park legislation and legislative history and NPS policies. The statements reaffirm the reason(s) for which the park was set aside as a unit of the national park system and provide the foundation for park management and use. The reasons for which the park was established provide the most fundamental criteria for determining actions proposed in the general management plan. The following park purpose was identified in the 1968 and 1980 enabling legislation (see appendix A for the complete text of the legislation):

> *To preserve and protect for the education, inspiration, recreation, and enjoyment of present and future generations a rare combination of terrestrial, marine, and amphibious life in a tropical setting of great natural beauty.*

Significance

Significance statements capture the essence of Biscayne National Park's importance to our country's natural and cultural heritage and capture what attributes make the park resources and values important enough to be included in the national park system.

Significance statements do not inventory park resources; rather, they describe the park's distinctiveness and help to place the park within its regional, national, and international contexts. Significance statements answer questions such as: "What is special about Biscayne National Park resources? What do they contribute to our natural and cultural heritage?" Defining the park's significance helps managers make decisions that preserve the resources and values necessary to accomplish the park's purpose.

Biscayne National Park is a significant resource to the American public because of the following:

- The park's coral reefs and keys, estuarine bay, and mangrove coast is a significant and integral portion of the South Florida ecosystem within the wider Caribbean community where diverse, temperate, and tropical species mingle.
- Visitors enjoy opportunities for a multitude of recreational activities near one of the country's major metropolitan centers and find inspiration in Biscayne's tranquility, solitude, scenic vistas, underwater environment, and diverse sounds of nature.
- The park encompasses much of the northernmost extent of the fragile Florida Reef Tract and associated coastal systems, which are characterized by numerous transitions in the physical and biological environment.
- Biscayne National Park preserves a largely undisturbed gene pool of tropical and subtropical flora.
- Biscayne National Park provides a rare opportunity to experience largely undeveloped Florida Keys with forest and shoreline vegetation and wildlife surrounded by clear tropical waters and fresh sea breezes.
- Biscayne National Park preserves unique marine habitat and nursery environments that sustain diverse and abundant native fishery resources.
- The park's submerged and terrestrial resources represent a sequence of rich

history encompassing early settlement, agricultural and maritime activities, development of the islands, and the melding of diverse cultures.

- The park offers outstanding opportunities for education and scientific research because of the diversity and complexity and interrelatedness of its natural and cultural resources, and the park provides a dynamic place to study marine and terrestrial ecosystems near a large urban population.

INTERPRETIVE THEMES

Interpretive themes describe those ideas, concepts, or messages about Biscayne National Park that are important for all visitors to understand. Based on the area's purpose and significance, themes provide guidelines for making decisions concerning which interpretive stories would be told to visitors and what interpretive facilities and activities would be required to tell those stories. Themes do not include everything that may be interpreted, but they include those ideas that are important to understanding the significance of the park. All interpretive efforts (both media and personal services) should relate to the theme or subtheme.

Park interpreters link these themes to NPS national themes for cultural and natural history to develop compelling stories for presentation to visitors through interpretive activities.

Following are the primary interpretive themes for Biscayne National Park.

Biological Uniqueness

As part of the wider Caribbean biological community, the park's four primary ecosystems (mangrove shoreline, subtropical estuarine bay, Florida Keys, and coral reef) are home to numerous tropical/subtropical animals and plants found nowhere in the United States but South Florida.

Biological Diversity

Because of its location between tropical and temperate regions and its major marine ecosystems, Biscayne National Park is home to an incredible diversity of wildlife and plants, more than most U.S. national parks. Coral reefs are considered the second-most biologically diverse ecosystem in the world.

Cultural Significance

The unique geography and climate and the presence of major marine resources within the boundaries of Biscayne National Park have set the stage for a significant cultural history, including a rich American Indian heritage, Spanish exploration, seafaring commerce, pirates, shipwrecks, sponge and sea turtle fishermen, island homesteaders, wealthy businessmen and entrepreneurs, presidents and politicians, and a lengthy grassroots environmental battle to preserve the area.

Endangered National Park

The natural processes responsible for creation of the resources found in Biscayne National Park have been and continue to be altered by human interaction on a regional and global level. Altered water delivery systems, reduced water quality, marine debris, damage to marine communities from vessel groundings, fishing pressures, pollution, rapid population growth, adjacent land development, increased water temperatures, and projected sea level rise and global climate change all threaten the sustainability of these rich resources (IHDP 2008).

Opportunities to Connect to an Urban National Park

Located between the Greater Miami urban area and the Florida Keys, Biscayne National Park offers neighbors and visitors from around the world opportunities to connect to the natural and cultural heritage preserved within the park. As the largest marine park in the national park system and one of the nation's southernmost national parks, Biscayne is an ideal place to connect with, learn from, and enjoy a variety of educational and recreational activities year-round.

SPECIAL MANDATES AND ADMINISTRATIVE COMMITMENTS

Special mandates and administrative commitments refer to park-specific requirements. These formal agreements are often established concurrently with the creation of a unit of the national park system. Biscayne National Park has several mandates and commitments that impact daily activities. A key legal requirement of the park is to consult with the State of Florida on park fishery resource management (described below). The park manages several right-of-way easements with other entities according to state and federal property laws, such as Florida Power & Light Company, the Florida Inland Navigation District, and the Air Force Sea Survival School.

Fishing

Section 4 of Public Law 90-606 (October 18, 1968), which established Biscayne National Monument, provided that the waters within the national monument

> *shall continue to be open to fishing in conformity with the laws of the State of Florida except as the Secretary [of the Interior], after consultation with appropriate officials of said State, designates species for which, areas and times within which, and methods by which fishing is prohibited, limited or otherwise regulated in the interest of sound conservation or in order to achieve the purposes for which the national monument is established.*

Section 103(a) of Public Law 96-287 (June 28, 1980), which established Biscayne National Park and added new land to the park north of Boca Chita Key, reiterated much the same language regarding fishing. This section stated that

> *. . . waters within the park shall continue to be open to fishing in conformity with the laws of the State of Florida except as the Secretary [of the Interior], after consultation with appropriate officials of said State, designates species for which, areas and times within which, and methods by which fishing is prohibited, limited, or otherwise regulated in the interest of sound conservation to achieve the purposes for which the park is established: Provided, That with respect to lands donated by the State after the effective date of this Act, fishing shall be in conformance with State law.*

Congress therefore directed the National Park Service to "manage this area in a positive and scientific way to protect the area's natural resource integrity." Also, and in accordance with Title 16 of the *United States Code* (USC), Congress directed that "the waters within the park shall continue to be open to fishing in conformity with the laws of the State of Florida" (16 USC 410gg-2).

While Biscayne National Park enabling legislation establishes that fishing will continue to occur in Biscayne National Park waters in accordance with state regulations, Biscayne National Park must also manage its fishery resources according to park and NPS mandates and legislation. For example, Congress directed that the Secretary of the Interior, after consultation with appropriate

officials of the state, may designate species for which, areas and times within which, and methods by which fishing is prohibited, limited, or otherwise regulated in the interest of sound conservation to achieve the purposes for which Biscayne National Park was established (16 USC 410gg-2). Thus, even though fishing regulations in park waters should conform to state regulations, the Secretary of the Interior has the ability to establish additional fishing regulations pertaining strictly to Biscayne National Park. Complicating this issue, however, is the provision that expansion areas donated by the state after the act's effective date must be in conformance with state law. In terms of management, Biscayne National Park can be divided into two zones: (1) the original monument zone in which fishing regulations follow state regulations, with the opportunity for the Secretary of the Interior to enforce additional regulations as deemed necessary, and (2) the expansion zone in which state regulations are enforced and in which the Secretary of the Interior cannot institute additional regulations (see 16 USC 410gg-2).

Regulatory responsibility of the State of Florida with respect to fishing on additional lands conveyed to the national park after the effective date of Public Law 96-287 was set forth in a board of trustees of the Internal Improvement Trust Fund Dedication dated December 13, 1985, which contained the following special reservation: "All rights to fish on the waters shall be retained and not transferred to the United States and fishing on the waters shall be subject to the laws of the State of Florida." To avoid a confusing array of different fishing regulations within park boundaries, the National Park Service has long used state fishing regulations throughout the park. NPS law enforcement rangers enforce State of Florida fishing regulations in the park. State of Florida law enforcement officers with the FWC have jurisdiction within the park as well. By working together, the National Park Service and FWC hope to enhance coordination of the park's fishery resources.

A memorandum of understanding among the State of Florida, the FWC, and the National Park Service, Biscayne National Park was executed on October 10, 2002 (renewed in 2007 for five years and in 2012 for two years), to facilitate management, protection, and scientific study of fish and aquatic resources within the park. In the memorandum, the parties agreed to manage fishery resources within the national park and Biscayne Bay "according to applicable Federal and State laws, and in a manner that promotes healthy, self-sustaining fish populations and recognizes the biological characteristics and reproductive potential of individual species." The parties have developed "a comprehensive fishery management plan" for the "long-term management of fish and aquatic resources" within the national park. The plan was completed in July 2014—the National Park Service worked within the framework of the memorandum of understanding, which states: "The Florida Fish and Wildlife Conservation Commission and the park recognize that the park intends to consider the establishment of one or more marine reserves (no-fishing areas) under its GMP process for purposes other than sound fishery management." The park continues to work with the FWC on following through with the recommendations of the *Fishery Management Plan* (2014) and, where appropriate, the General Management Plan. For more information on the *Fishery Management Plan*, please visit http://www.nps.gov/bisc/parkmgmt/fishery-management-plan.htm.

Personal Watercraft

Motorized personal watercraft use is prohibited in units of the national park system, except in designated areas. On March 21, 2000, the National Park Service designated units of the national park system where personal watercraft use may be allowed using the criteria and procedures listed in 36 *Code of Federal Regulations* (CFR) 1.5, *Closures and Public Use Limits* and 36 CFR 1.7, *Public Notice*. Biscayne National Park was not listed as one of the units of the national park

system where personal watercraft use could be designated. Therefore PWC use is not allowed in the park.

Easements

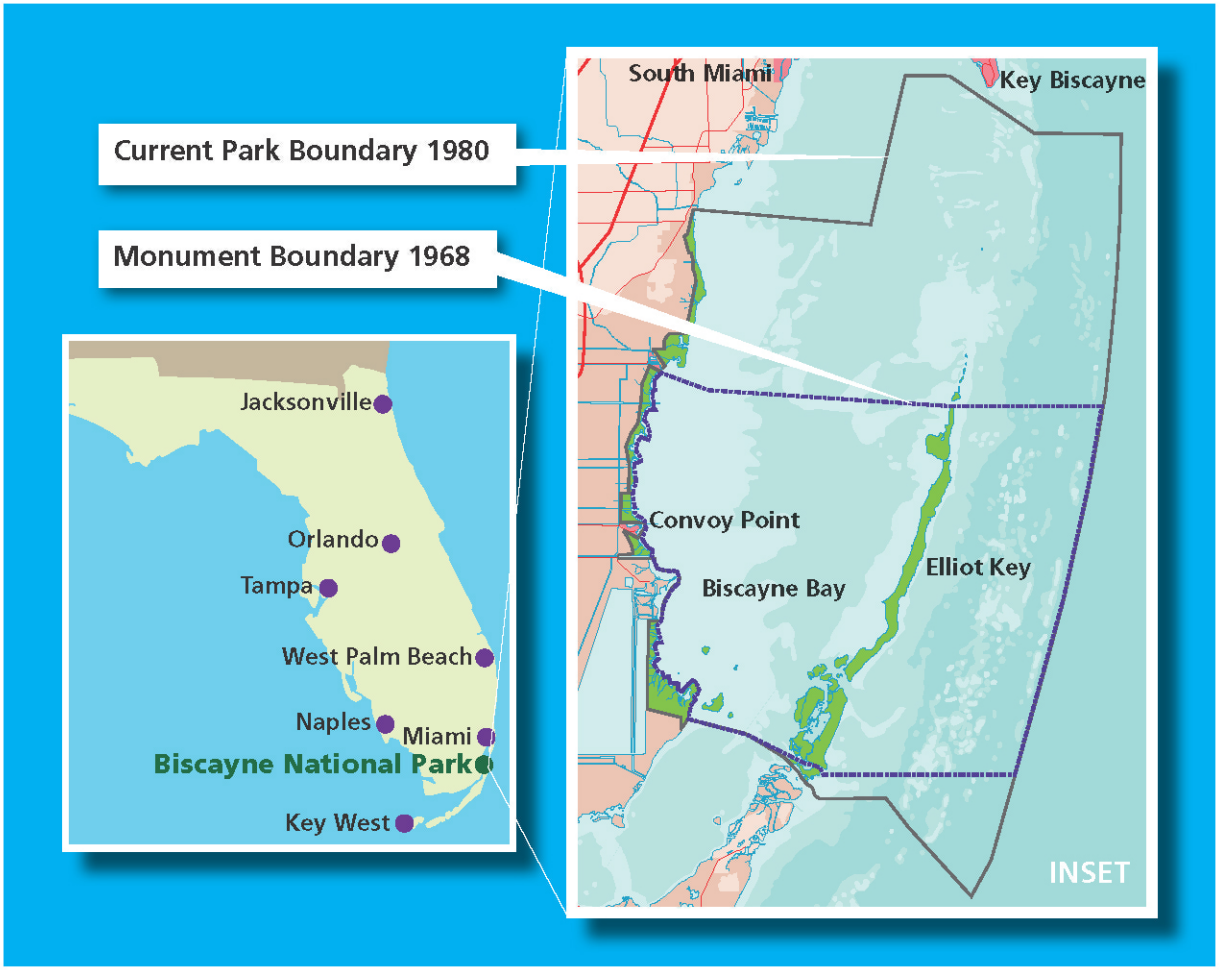
The U.S. Department of Defense holds an easement for the Air Force Sea Survival School to conduct activities in an area comprising 4 nautical square miles of surface area near the seaward end of the Turkey Point Channel entrance marker. The school was moved to Key West after the destruction of its facilities by Hurricane Andrew in 1992. This easement should be reviewed for possible elimination.

The Miami-Dade County Parks, Recreation and Open Spaces Department operates two county parks and public marinas with navigational easements through Biscayne National Park—Black Point and Homestead Bayfront. Both easements were granted by the state in 1970. These county easements are preserved through (1) a 1974 memorandum of agreement between the county and the National Park Service, and (2) a 1979 deed transferring submerged lands to the U.S. government from the state. Both the Black Point and Homestead Bayfront channel easements extend from county parks to or toward the Intracoastal Waterway (ICW) with specified dimensions of 31,000 feet in length and 150 feet in width. Two other easements are held by Florida Power & Light Company, one of which is for its Turkey Point Channel.

The other was established east of the Military Canal when a large refinery was proposed for the area around the canal during the late 1960s. That proposal called for a channel to be dredged between the Military Canal and Lewis Cut and then across the coral reef platform. Controversy over this proposal was a primary reason for establishment of Biscayne National Park.

There are six channel easements in the park reserved by the state. These reservations, which were effected by resolution (Dade County Resolution No. 280-69, March 12, 1969, and State of Florida Resolution, May 20, 1969) and in the agreement on the Offer to Sell Real Property (May 20, 1969) executed by the United States with the State of Florida, consist of six 150-foot-wide navigation channels in the submerged lands in Biscayne Bay. Three of these channels (Turkey Point Oil Barge Channel, Goulds and Black Creek Canals [Black Point Marina], and Homestead Bayfront Park) are currently in use. The remaining three easements—which are unnamed—are totally undeveloped. Any proposed alteration to the existing conditions would require an environmental study and NPS approval.

FIGURE 1. ORIGINAL MONUMENT BOUNDARY AND NATIONAL PARK BOUNDARY



Jurisdiction

Lands within park boundaries are administered under concurrent jurisdiction with local law enforcement agencies, meaning that any commissioned law enforcement officer may enforce state and federal laws within the park.

The Intracoastal Waterway bisects Biscayne National Park. The Florida Inland Water Department was established by the U.S. Congress and mandated to maintain the waterway to a depth of 7 feet throughout its length in the park. This mandate affects two areas in the park— West, Middle, and East Featherbed Banks in the central portion of Biscayne Bay and Cutter Bank on the park's southern boundary. The remainder of the waterway in the park has a greater depth than 10 feet—3 feet deeper than the minimum depth established by congressional mandate (Intracoastal Waterway 2002).

The City of Islandia, within park boundaries on Ragged Key No. 3, was formerly a legal jurisdiction established under Florida state law. In 2012, Islandia was dissolved by resolution of the Miami-Dade County Board of County Commissioners.

Special Use Permits

Biscayne National Park issues one-year research permits to researchers via the NPS Research Permit and Reporting System. There are national general conditions and general conditions specific to the park associated with these permits. A review team consisting of the park research permit coordinator and subject matter experts review the plan, propose permit-specific conditions, and recommend approval or disapproval of the permit to the park superintendent. Researchers could request to perform their studies in any zone in any of the alternatives proposed in this plan; the review team would continue to determine appropriateness per environmental sensitivity and NPS standards for each research proposal.

One-time special use permits are also issued by Biscayne National Park for special events such as weddings, picnics, and scout camporees.

Public Law 105-391, section 418, authorizes the National Park Service to issue commercial use authorizations (CUAs) for any visitor services activity by an individual or group for commercial gain (guided fishing, boat tours, tow boats, etc.). A commercial visitor service activity is defined as any or all goods, activities, services, agreements, or anything offered to park visitors and/or the general public for recreational purposes that use park resources; is undertaken for or results in compensation, monetary gain, benefit, or profit to an individual, organization, or corporation; whether or not such entity is organized for purposes recognized as nonprofit under local, state, or federal law. A commercial use authorization may overlap the operations undertaken by a concessioner that operates under a concessions contract.

Public Law 106-206 requires that all commercial filming activities undertaken in any national park system unit must be accomplished under the authority of a commercial filming permit. Any filming (video or sound recording) production intended for a commercial market will require the advance issue of a commercial filming permit from the park. Commercial still photography requires a commercial filming permit only when the activity will occur in areas normally closed to the public, when the photographer will use props or models not normally associated with the national park system unit, or when management of the activity is required to ensure safety or resource protection.

SERVICEWIDE LAWS AND POLICIES

This section identifies what must be done at Biscayne National Park to comply with federal laws and NPS policies. Many park management directives are specified in laws and policies guiding the National Park Service and are therefore not subject to alternative

approaches. For example, there are laws and policies about managing environmental quality (such as the Clean Air Act, the Endangered Species Act, and Executive Order 11990, "Protection of Wetlands"); laws governing the preservation of cultural resources (such as the National Historic Preservation Act [NHPA]and the Native American Graves Protection and Repatriation Act); and laws about providing public services (such as the Americans with Disabilities Act [ADA])—to name only a few. In other words, a general management plan is not needed to decide that it is appropriate to protect endangered species, control exotic invasive species, protect archeological sites, conserve artifacts, or provide universal accessibility. Laws and policies have already decided those and many other issues for us. Although attaining some of these conditions set forth in these laws and policies may have been temporarily deferred in the park because of funding or staffing limitations, the park staff will continue to strive to implement these requirements with or without a new general management plan.

Some laws and executive orders are applicable solely or primarily to units of the national park system. These include the 1916 Organic Act that created the National Park Service, the General Authorities Act of 1970, the act of March 27, 1978, relating to the management of the national park system, the Park System Resource Protection Act, and the National Parks Omnibus Management Act (1998). Other laws and executive orders have much broader application such as the Endangered Species Act, the National Historic Preservation Act, and Executive Order 11990 that address the protection of wetlands.

The NPS Organic Act (16 USC 1) provides the fundamental management direction for all units of the national park system:

> *[P]romote and regulate the use of the Federal areas known as national parks, monuments, and reservations . . . by such means and measure as conform to the fundamental purpose of said parks, monuments and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.*

The National Park System General Authorities Act (16 USC 1a-1 et seq.) affirms that while all national park system units remain "distinct in character," they are "united through their interrelated purposes and resources into one national park system as cumulative expressions of a single national heritage." The act makes it clear that the NPS Organic Act and other protective mandates apply equally to all units of the system. Further, amendments state that NPS management of park units should not "derogat[e] . . . the purposes and values for which these various areas have been established."

The National Park Service also has established policies for all units under its stewardship. These are identified and explained in a guidance manual titled NPS *Management Policies 2006*. The alternatives considered in this document incorporate and comply with the provisions of these mandates and policies (NPS 2006).

To truly understand the implications of an alternative, it is important to combine the servicewide mandates and policies (see appendix B) with the management actions described in each alternative.

The alternatives in this general management plan address the desired future conditions that are not mandated by law and policy and must be determined through a planning process.

Impairment of National Park Resources

In addition to determining the environmental consequences of implementing the preferred and other alternatives, NPS *Management Policies 2006* (section 1.4) requires analysis of potential effects to determine whether or not proposed actions would impair a park's resources and values.

The fundamental purpose of the national park system, established by the NPS Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values. However, the laws do give the National Park Service the management discretion to allow impacts on park resources and values when necessary and appropriate to fulfill the purposes of the park. That discretion is limited by the statutory requirement that the National Park Service must leave resources and values unimpaired unless a particular law directly and specifically provides otherwise.

Impairment is an impact that, in the professional judgment of a responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values (NPS *Management Policies 2006*). An adverse impact on any park resource or value may, but does not necessarily, constitute impairment. An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, or
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or
- identified in the park's general management plan or other relevant NPS planning documents as being of significance.

Impairment may result from visitor activities; NPS administrative activities; or activities undertaken by concessioners, contractors, and others operating in the park. Impairment may also result from sources or activities outside the park.

An evaluation of impairment is not required for some impact topics, including visitor experience (unless the impact is resource based), NPS operations, or the socioeconomic environment. When it is determined that an action(s) would have a moderate to major adverse effect, the National Park Service makes a finding of nonimpairment. The determination of impairment for the proposed action is included in the Record of Decision.

BOUNDARY MODIFICATION

The National Park Service is required to analyze the need for possible modifications to a park's external boundaries in all general management plans.

Biscayne National Monument was authorized by an act of Congress in 1968, expanded in 1974, and redesignated as a national park and expanded again in 1980. The current boundary is considered adequate to protect and manage the park's fundamental resources with the following exception.

The park boundary could be expanded westward, northward, and/or southward to assist in providing continued visitor services and park operations if necessitated by the predicted sea level rise related to climate change. If that occurs and if lands meeting NPS needs/requirements become available, a boundary assessment would be completed. The boundary could then be modified as authorized by section 101 of Public Law 96-287.

RELATIONSHIP OF OTHER PLANNING EFFORTS TO THIS GENERAL MANAGEMENT PLAN

Other plans and planning projects have influenced or would be influenced by the approved *Final General Management Plan / Environmental Impact Statement* for Biscayne National Park. These plans have been prepared (or are being prepared) by the National Park Service and other federal, regional, state, and local agencies and organizations. Those most directly related to this general management plan or are potentially affected by it are described below.

NPS PLANS / PLANNING EFFORTS

Fishery Management Plan

The *Fishery Management Plan* is a long-term plan to manage fish and shellfish stocks in Biscayne National Park to ensure that the tradition of fishing can continue for generations to come.

The purpose of the plan is to guide sustainable use of the park's fishery-related resources. By working together, the National Park Service and FWC hope to enhance coordination of the park's fishery resources. The plan is a cooperative effort by park staff and the FWC, with input from members of government agencies, area universities, and the public.

The planning effort began with public meetings in May 2002 and a working group formed by the Sanctuary Advisory Council for the Florida Keys National Marine Sanctuary in cooperation with the park and the FWC (consisting of recreational and commercial fishers, divers, scientists, and members of the conservation community), which developed recommendations. In October 2004, the working group finalized its recommendations, which were endorsed and forwarded to the FWC and Biscayne National Park. Many of the recommendations were used in the development of the *Fishery Management Plan*. The draft plan was presented to the public in 2009. The Record of Decision for the final plan was signed on July 10, 2014.

The goals of the *Fishery Management Plan* support the broader vision for park management described in this general management plan.

The *Fishery Management Plan* recommends changes in current management strategies for both recreational and commercial fishing activities that would be achieved via new, park-specific federal and state fishing regulations. Specific regulatory changes under the final *Fishery Management Plan* preferred alternative include: developing park-specific fishing regulations (in conjunction with the FWC) to increase the abundance and average size of targeted fish and invertebrate species within the park by at least 20% over current conditions and over conditions in similar habitat outside the park; elimination of the two-day lobster port season; prohibition of the use of an air supply or gear with a trigger mechanism while spearfishing; phasing out commercial fishing via the requirement that all commercial fishers must purchase a limited-entry, special use permit from the park superintendent. The permit would be permanently nontransferable, would require annual renewal, and would be "use or lose" such that a permit could not be renewed if (1) it was not renewed the previous year, or (2) no catch was reported in the previous year; establishment (by the FWC) of coral reef protection areas to delineate coral reef habitat on which lobster and crab traps could not be deployed. Traps within the coral reef protection areas could be moved outside area boundaries by authorized FWC or park staff, or other authorized personnel. Additionally, the trap number from traps observed within coral reef protection areas would be recorded,

and traps with three or more recorded violations could be confiscated from park waters; proposal of a no-trawl zone within the bay, in which commercial shrimp trawling would be prohibited. This zone would serve to protect juvenile fish and invertebrates commonly caught as bycatch in trawls, as well as protect essential fish habitat. The new park-specific State of Florida fishing regulations have yet to be drafted, and the schedule for their approval and establishment is unknown at this time. These new regulations will be implemented through the federal rulemaking process (for federal rules) and through the FWC's rulemaking process (for park-specific state rules). The public will have the opportunity to comment on all proposed regulatory changes. For more information on this plan, please visit http://www.nps.gov/bisc/parkmgmt/fishery-management-plan.htm.

Mooring Buoy and Marker Plan

Biscayne National Park has initiated a Mooring Buoy and Marker Plan to identify buoy and marker locations and criteria for selecting new Maritime Heritage Trail locations. The plan would address environmental monitoring protocol, visitor crowding, maintenance, and educational issues associated with the buoys. This plan would include an adaptive management framework for mooring buoys and markers.

The Mooring Buoy and Marker Plan was released for public comment in July 2010 and had both controversial and noncontroversial aspects. The National Park Service suspended work on the Mooring Buoy and Marker Plan to focus on completing other planning efforts. The National Park Service has implemented some of the noncontroversial aspects of the Mooring Buoy and Marker Plan separately using appropriate environmental review processes. For example, additional mooring buoys were installed on the reef tract and the Maritime Heritage Trail was completed.

Other NPS Plans

In addition to the overall vision and management plans described above, the National Park Service carries out other planning efforts and studies covering such topics as natural and cultural resource restoration and preservation, visitor use, transportation, and park operations. The following studies and plans guide important aspects of park management but do not directly relate to the alternatives or other components of this general management plan.

Adjacent Lands Protection Plan

The existing plan, dated January 1991, is being updated by park staff for future review and approval by the Southeast Region.

Collections Management Plan

The South Florida Parks Collections Management Plan (2007) guides the management and care of museum objects for five South Florida national parks including Biscayne. Actions proposed in this general management plan comply with the interpark collections management plan.

Coral Reef Restoration Plan

Biscayne National Park completed a plan on managing the restoration of coral reefs that have been damaged by vessel groundings. The plan provides a systematic approach to addressing injuries to coral reefs caused by vessel groundings within the park. The Record of Decision for this plan was signed on May 31, 2012.

Fire Management Plan

The park's *Fire Management Plan* was approved on April 23, 2004. The plan was designed to meet the park's specific resource management needs while also ensuring that

public and firefighter safety is not compromised. The plan addresses both wildland fires (human-caused or naturally ignited by sources such as lightning strikes) and debris burning (small-scale burning of debris piles resulting from maintenance or resource management activities). Fire management to protect resources and visitors is supported by all aspects of this general management plan.

Exotic Plant Management Plan

Nonnative plants are ecologically harmful, frequently displacing or otherwise impairing the function of native plant communities. They can also alter historic landscapes, damage cultural resources, and interfere with visitor use and enjoyment. Management of nonnative plants relates to all aspects of this general management plan and is supported by NPS policy on invasive species.

Everglades, Dry Tortugas, and Biscayne national parks; Big Cypress National Preserve; and five other South Florida and Caribbean units in the national park system have prepared a *South Florida and Caribbean Parks Exotic Plant Management Plan / Environmental Impact Statement*. Other parks included in the planning effort are Canaveral National Seashore, Buck Island Reef National Monument, Christiansted National Historic Site, Salt River Bay National Historical Park and Ecological Preserve, and Virgin Islands National Park. The Record of Decision for this plan was signed on October 15, 2010.

Lionfish Response Plans

The exotic invasive lionfish (*Pterois volitans*) is a venomous predatory fish native to the Indian and Pacific oceans and first observed in South Florida in the 1980s. Lionfish are voracious predators of fish and invertebrates that are capable of removing large numbers and amounts of prey (fish and invertebrates) and out-competing the park's native predatory fish. Lionfish have been documented to cause ecological impacts to coral reefs and other habitats. Lionfish possess venomous spines in some of their fins, which means that they also pose envenomation risks to visitors and employees. While envenomation is not deadly, it can cause serious problems including intense pain, burning, swelling, redness, bleeding, joint pain, anxiety, headache, disorientation, dizziness, nausea, paralysis, and convulsions.

The National Park Service has prepared the *Lionfish Response Plan: A Systematic Approach to Managing Impacts from the Lionfish, an Invasive Species, in Units of the National Parks System* (2012) to guide the National Park Service and its partners in adequately addressing the invasion of the lionfish in marine waters of the national park system units in the Caribbean, the Gulf of Mexico, and the east coast of the United States, including Biscayne National Park. The plan describes servicewide approaches for lionfish management and sets the framework for parks to develop their own site-based plans specific to their park. These servicewide provisions include prevention and mitigation of lionfish impacts on park resources; protection of health and safety of visitors, staff, partners, and contractors; and public information.

Biscayne National Park's *Lionfish Management Plan* calls for continuous lionfish control (removal efforts) to suppress the population and keep the lionfish population at acceptable levels. Management actions focus on controlling the population, as resource managers acknowledge that complete eradication is most likely an unattainable and unrealistic goal. Efforts to reduce the presence and abundance of lionfish in Biscayne National Park have beneficial impacts on the park's natural resources, visitor experience, and human health and safety.

General Management Plan Amendment Stiltsville Management Plan

A 2003 decision placed management of the remaining Stiltsville houses (see the discussion of Stiltsville in chapter 2 under "Actions Common to All Alternatives") under the care of the nonprofit Stiltsville Trust.

Homestead-Biscayne Buffer Area Report

A 1997 NPS study found that land uses providing open space and agricultural space near Biscayne National Park are essential to protect the significant resources and values of the park.

Miami Circle Special Resource Study

A study of the Miami Circle Site was completed by the National Park Service in 2008 and found that the site was not suitable to become a part of Biscayne National Park. It is now managed by HistoryMiami (formerly the Historical Museum of Southern Florida).

Virginia Key Beach Park Special Resource Study

A 2008 decision found that the site is not nationally significant or suitable for inclusion in the national park system.

Commercial Air Tour Voluntary Agreement

This voluntary agreement provides the terms and conditions for commercial air tours to be conducted over Biscayne National Park as an alternative to an air tour management plan, under the provisions of the National Parks Air Tour Management Act of 2000 as amended by the Federal Aviation Administration Modernization and Reform Act of 2012. The parties to this agreement are the National Park Service, the Federal Aviation Administration, and commercial operators.

PLANNING EFFORTS BEYOND THE NATIONAL PARK SERVICE

Biscayne National Park staff work collaboratively with other agencies, partners, and neighbors on the following planning efforts. To the extent possible, all proposals in the general management plan are in accordance with these other planning processes.

Other Federal Plans

- Biscayne Bay Coastal Wetlands Plan
- Comprehensive Everglades Restoration Plan
- Department of the Interior Science Plan
- Marine Sanctuary Management Plan
- United States Coral Reef Initiative
- Homestead Air Force Base Cleanup
- Florida Manatee Recovery Plan
- NOAA Fisheries Recovery Plan for Elkhorn Coral and Staghorn Coral
- Southern Florida Multi-Species Recovery Plan
- Draft Environmental Impact Statement for Florida Power & Light Company's proposed Turkey Point Nuclear Plant Units 6 and 7 project scheduled for release in February 2015
- NOAA Fisheries, *Smalltooth Sawfish Recovery Plan* (*Pristis pectinata)*

State and Regional Plans

- Biscayne Bay Surface Water Improvement and Management Plan Planning Document

- Lower East Coast Regional Water Supply Plan
- Biscayne Bay Partnership Initiative
- Southeast Florida Coral Reef Initiative
- John Pennekamp Coral Reef State Park Approved Management Plan
- Biscayne Bay Aquatic Preserves Management Plan
- Dade County Manatee Protection Plan

City and Local Plans

- South Miami-Dade Watershed Study and Plan
- Miami-Dade County Comprehensive Development Master Plan
- Miami-Dade County's Urban Development Boundary Issue
- Biscayne Bay Strategic Access Plan
- Local Greenway and Blueway plans
- Wastewater Reuse Agreement

PLANNING ISSUES AND CONCERNS

INTRODUCTION

The general public; NPS staff with their knowledge about past planning efforts; representatives from other county, state, and federal agencies; and representatives from various organizations identified various issues and concerns during scoping (early information gathering that took place in 2001, 2003, and 2009) for the 2011 Draft Plan. An issue is defined as an opportunity, conflict, or problem regarding the use or management of public lands. Comments were solicited at public meetings, through planning newsletters, and on the NPS planning website (see "Chapter 5: Consultation and Coordination").

Comments received during scoping demonstrated that there is much that the public likes about the park—its resources, management, use, and facilities. The issues and concerns generally involve determining the appropriate visitor use and the types and levels of facilities, services, and activities, while remaining compatible with desired resource conditions. The GMP alternatives provide strategies for addressing the issues within the context of the park's purpose, significance, and special mandates.

ISSUES ADDRESSED IN THIS PLAN

In general, these issues focus on concerns about the long-term health of park resources and providing the visiting public with enjoyable and quality experiences.

Natural Resources

About 95% of the park is water encompassing a mosaic of submerged aquatic communities including seagrasses, hardbottom, barebottom, and coral reef. Almost 50% of the park area is seagrass beds or meadows. The park's proximity to a growing metropolitan population with over 200,000 registered vessels is increasing pressure on the park's submerged aquatic communities. The greatest threat to the productivity of the seagrass beds are vessel groundings and scarring by motorboat propellers. Currently, there are a limited number of zones that provide targeted resource protection with defined desired resource conditions and visitor experiences.

The coral reefs of Biscayne National Park have the attention of national and global reef conservation initiatives. Coral reefs are in serious decline globally, especially those near shallow shelves and dense populations. In the Florida Keys, because of nearby dense populations of people and the effects of hurricanes, vessel groundings, disease, overfishing, and a proliferation of algae, there has been a 37% decline in live coral cover in just five years according to a 2002 report by NOAA Fisheries. In addition to impacts on coral, fish populations, and coastal protection, the decline could affect tourism; currently, more than 4 million tourists visit the Florida Keys annually. Some members of the public have voiced the desire to see reserves established; others noted that many people's livelihood depend on fishing. The possibility of including a marine reserve or special recreation zone in Biscayne National Park has both proponents and opponents in the park's user community and beyond, including commercial and recreational anglers, divers, and snorkelers, boat enthusiasts, and environmental advocates. Parkwide fishery management is addressed in the separate and previously described *Fishery Management Plan*. For more information on this plan, please visit http://www.nps.gov/bisc/parkmgmt/fishery-management-plan.htm.

Because establishment of a marine reserve zone would prohibit all commercial fishing in the zone following passage of a park special

regulation, the possibility is addressed in this *Final General Management Plan / Environmental Impact Statement.*

Visitor Experience

The park's proximity to Miami-Dade County and its growing metropolitan population are increasing pressures on the park to accommodate local recreational demand. Recreational activities occasionally result in visitor conflicts, accidents, and resource damage. Vessel groundings cause long-term scarring of the bay floor and damage to coral. Boat anchors damage coral. Propellers can injure manatees, sea turtles, seagrass beds, and corals. Debris from fishing activities has damaged historic underwater resources and coral reefs. Also, conflicts among different recreational groups occur. Wakes from larger, faster boats swamp smaller, slower boats. The noise of motorboats or "partying" groups diminishes efforts of recreational paddlers to experience quieter environments. Currently, there is no place within the park where visitors who snorkel and dive can experience a healthy, natural coral reef or at least a zone reflecting heightened protection above that afforded by state fishing regulations. The challenge to park management is finding and managing for a user capacity that enables visitors to have a quality experience while protecting park resources for future generations.

The only mainland-based park visitor center is 35 miles south of Miami, frequently a 1.5- to 2.0-hour drive for Miami residents and nonlocal visitors arriving at the airport or Port of Miami. Due to its remote location, this visitor contact center receives less than 10% of total park visitation. This situation makes it difficult for the park to determine the type and level of visitor use it receives. It also makes it difficult to provide important information on park rules, regulations, navigational information, events, and activities to park users and visitors.

Park Operations

Visitors have uncontrolled access to and from open waters of the bay and ocean, including the Intracoastal Waterway. Access points at developed areas include county and state parks and private and commercial developments in the Miami, Key Biscayne, and Key Largo areas. Because of the impracticality of marking the marine park's entire 50-mile water boundary, many park users are unaware of the fact that they are in a national park.

The northern part of the park, including Stiltsville, receives little law enforcement coverage and the park's ability to protect resources and respond to emergencies is limited by the hour-long boat ride from park headquarters at Conway Point.

Climate Change

There are two different issues to consider with respect to climate change and general management planning: (1) what is the contribution of the proposed action to climate change, such as greenhouse gas emissions and the carbon footprint, and (2) what are the anticipated effects of climate change on park resources and visitors who are affected by the management alternatives? Because the contribution of the proposed action to climate change is negligible under any alternative, the former issue has not been carried forward for consideration in this plan. The latter issue, a discussion of the anticipated effects of climate change on park resources, has been carried forward.

Other factors driving environmental change include population growth in the area (subsidence of water table, increased visitation, pollution), shifts in visitor use patterns, and land use change and development around the park.

Global-scale stressors such as climate change and ocean acidification can affect coral reefs in many ways, including altering calcification

rates and increasing prevalence of bleaching and disease. These effects alter the planktonic base of the food web, for example. Hurricane activity and slow coral regeneration rates, which vary with the intensity of a particular hurricane, can also diminish overall coral cover (Gardner et al. 2004). Few NPS management actions exist that would directly reduce the effects of climate change and ocean acidification. However, taking actions to protect reefs from other pressures such as overfishing; land-based sources of pollution; and physical damage from fishing gear, anchoring, and vessel groundings might increase reef resiliency, potentially delaying the effects of global stressors.

ISSUES AND CONCERNS NOT ADDRESSED IN THE GENERAL MANAGEMENT PLAN

Not all of the issues or concerns raised by the public are included in this general management plan. Other issues raised by the public were not considered because they are already prescribed by law, regulation, or policy (see the "Servicewide Mandates and Policies" section), or they

- would be in violation of laws, regulations, or policies; or
- were at a level that was too detailed for a general management plan and are more appropriately addressed in other planning documents (outside the scope of a general management plan).

Many topics, such as fishery management, everglades restoration, and coral reef interagency management, are addressed in other park planning or in interagency planning and so are not specifically addressed in this general management plan but are included by reference.

Overfishing, both recreational and commercial, was identified as a concern by many because of its potential to deplete fish stocks, damage the coral reef, and destroy other species through accidental capture. Preliminary research data indicate that some fish populations have declined. The state manages fishing activities in the park. The issue of overfishing is addressed in the park's *Fishery Management Plan*, which was developed in consultation with the state.

Similarly, comments on the 2011 Draft Plan questioned NPS authority to allow commercial fishing in Biscayne National Park. The National Park Service acknowledges that a park special regulation through formal rulemaking processes would be needed to properly authorize existing commercial fishing at the park. The *Fishery Management Plan* recommends changes in current management strategies for both recreational and commercial fishing activities that would be achieved via new, park-specific federal and state fishing regulations. The preferred alternative in the *Fishery Management Plan* would require all commercial fishers to purchase a limited-entry permit from the park. The permit would be nontransferable, require annual renewal, and would be "use or lose." The permit could not be renewed if (1) it was not renewed the previous year, or (2) no catch was reported in the previous year. The intended purpose is to phase out commercial fishing in the park without having negative economic impacts on fishers who currently depend on park resources to support their livelihood. The new park-specific State of Florida fishing regulations have yet to be drafted, and the schedule for their approval and establishment is unknown at this time. These new regulations will be implemented through the federal rulemaking process (for federal rules) and through the FWC rulemaking process (for park-specific state rules). The public will have the opportunity to comment on all proposed regulatory changes. For more information on the *Fishery Management Plan*, please visit http://www.nps.gov/bisc/parkmgmt/fishery-management-plan.htm.

Because the *Fishery Management Plan* addresses future management of commercial fishing parkwide, the National Park Service

has determined that any regulatory and policy processes relevant to the parkwide phase-out of commercial fishing at the park is not addressed in the general management plan. The impacts of these proposed changes are assessed in the *Fishery Management Plan*.

The long-term health of park resources is heavily dependent on outside influences such as air and freshwater quality, quantity, and timing. Especially critical are the amount, flow rate, and quality of freshwater that enters the park from adjacent lands. Marshes adjacent to the park have been extensively drained, and all natural overland flow of water is now controlled and delivered to the coast through an extensive network of canals. Flood control gates at the mouth of each of these canals regulate the flow of water into the park. A multibillion dollar restoration project is underway in South Florida—the *Comprehensive Everglades Restoration Plan* (CERP). This plan is part of regional ecosystem restoration that includes projects to address the issues of freshwater availability, delivery, quality, and structure operations for Everglades and Biscayne national parks and the greater South Florida ecosystem. Another area of importance is the "Model Lands," an area of more than 55,000 acres. This area is the last large expanse of unprotected undeveloped land in the area and forms a land corridor between Biscayne and Everglades national parks. This area is the headwaters for Barnes and Card sounds, which directly feed Biscayne Bay in Biscayne National Park. One of the projects associated with the Comprehensive Everglades Restoration Plan is the Biscayne Bay Coastal Wetlands, which if implemented, would partially restore freshwater flow to coastal wetlands within and outside the park's western boundary. The National Park Service will continue to collaborate with entities beyond park boundaries to address water quality and many other concerns. These partnerships include those with federal, state, and local agencies; community groups; commercial organizations; and individuals.

The park has long identified a need to facilitate entry to and education about park resources and appropriate types of recreational activities and to provide added resource and visitor protection in northern Biscayne Bay. This is addressed in the park's Mooring Buoy and Marker Plan.

The park's cultural history is often forgotten or overlooked by the public, but there are both submerged and terrestrial cultural resources that help tell the stories of maritime and South Florida history. The eroding effect of natural processes on cultural resources creates a constant challenge to park management in protecting, preserving, and interpreting these windows to the past. This issue is addressed in the park's Mooring Buoy and Marker Plan.

Public access to the park and to locations inside the park is difficult for many. There is no public transportation to the park from Miami or Homestead. Once inside the park, unless visitors have their own boat, it is difficult to access places other than Convoy Point. The National Park Service is pursuing concession opportunities for visitors without a boat to access the islands for a fee. Visitors without personal boats find that they are unable to simply arrive at the park and visit the Keys.

Part of the visitor experience at Biscayne National Park is being able to see the land and seascape of bay, keys, ocean, and mangrove shoreline with minimal competition from human-made structures. As development moves south near the shoreline, there are increasing chances of these views being modified. Because this is occurring outside the park's boundaries, it is beyond the scope of an NPS plan.

IMPACT TOPICS: RESOURCES AND VALUES AT STAKE IN THE PLANNING PROCESS

An important part of planning is seeking to understand the consequences of making one decision over another. To this end, this general management plan is accompanied by an environmental impact statement. Environmental impact statements identify the anticipated impacts of possible actions on resources and on park visitors and neighbors. Impacts are organized by topic, such as "impacts on the visitor experience" or "impacts on vegetation and soils." Impact topics serve to focus the environmental analysis and to ensure the relevance of impact evaluation. The impact topics identified for this general management plan are outlined in this section. They were identified based on federal laws and other legal requirements, CEQ guidelines, NPS *Management Policies 2006*, staff subject-matter expertise, and issues and concerns expressed by the public and other agencies early in the planning process (see previous section). Also included is a discussion of some impact topics that are commonly addressed but that are not addressed in this plan for the reasons given.

IMPACT TOPICS TO BE CONSIDERED

Natural Resources

Fishery Resources. The restoration of healthy fish populations and fish habitat is important to the ecology of bay and reef habitats, the health and persistence of regional fish stocks, and the enjoyment of the recreating public. Although fishery resource management is being addressed separately via the *Fishery Management Plan*, alternatives presented in this plan could affect fishery resources, so this topic is retained for analysis. For more information on the *Fishery Management Plan*, please visit http://www.nps.gov/bisc/parkmgmt/fishery-management-plan.htm.

Threatened and Endangered Species. The Endangered Species Act requires federal agencies to ensure that their activities would not jeopardize the existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. Consultation with the U.S. Fish and Wildlife Service USFWS), NOAA Fisheries, and the FWC identified a number of threatened, endangered, or species of concern that warrants the inclusion of this topic in this *Final General Management Plan / Environmental Impact Statement*. Some species on this list were dismissed from detailed analysis because they do not exist in the park or would not be affected by any proposed actions. Table 6 (in chapter 2) provides a summary of the federally listed species; those that are retained for further analysis are the manatee, several sea turtle species, smalltooth sawfish, American crocodile, Schaus swallowtail butterfly, Miami blue butterfly, and stony corals. Actions proposed could affect listed species so this topic is retained for these species.

Special Status Species, including State Listed Species. Above the waterline, birds are perhaps the most conspicuous part of park wildlife. Many species of birds are permanent residents of the park, other species migrate through the area, and still others are exclusively winter or summer residents. The park has coastal and inland areas where a variety of migratory and nonmigratory birds roost, forage, nest, and/or loaf. Bird rookeries occur on the mainland in the mangrove shoreline and on several islands. The Arsenicker Keys in the southwest corner of the park are used heavily by roosting herons, pelicans, and cormorants. Soldier Key, Ragged Island No. 5, and a small area within Jones Lagoon are used heavily by double-crested cormorants.

Under all action alternatives, Arsenicker Key and West Arsenicker Key would be identified as sensitive resource zones because of their importance in providing nesting, roosting, foraging, and/or loafing habitat for numerous bird species. Consequently, visitor activities would not occur on these islands and no visitor facilities would be constructed. In other areas of the park, proposed actions would incorporate mitigation measures to reduce potential impacts on birds in the park. These measures include, but are not limited to, enforcing coastal set-back distances (following published recommendations) to minimize impacts on birds using coastal habitats and timing construction projects and other potentially disruptive activities so they do not correspond with breeding and nesting seasons. With mitigation, the potential impact of the proposed alternatives in this plan on birds in the park would be short and long term, localized, and negligible. The National Park Service has a memorandum of understanding with the U.S. Fish and Wildlife Service regarding conservation of migratory birds (USDI 2010). The National Park Service manages all state listed species the same as federally listed species, and many birds are special status state listed species (described fully in chapter 3); therefore, these species in particular are retained for analysis in chapter 4.

Terrestrial Vegetation. The Organic Act and NPS *Management Policies 2006* both require the protection and conservation of soil and vegetation resources that could be affected by actions that would change human use and development patterns in the park. The alternatives contain actions that could affect vegetation resources so this topic is retained for analysis.

Submerged Aquatic Communities. The Organic Act and NPS *Management Policies 2006* both require the National Park Service to protect and conserve native populations that could be affected by visitors, managers, and external sources. The park's aquatic communities are an important park resource and one of the attractions that add to the quality of visitor experience in the park. Changes in marine habitat or in populations of organisms would be of concern to visitors, the public, and park managers. Actions contained in the alternatives could affect submerged aquatic communities so this topic is retained for analysis.

Wetlands. The water resources in the park, including wetlands, are protected and managed in accordance with NPS *Management Policies 2006* (4.6.5); Executive Order 11990, "Protection of Wetlands"; and NPS Director's Order 77-1: *Wetland Protection*. This guidance requires the National Park Service to protect and enhance natural wetland values and to examine the impacts of park activities on wetlands. Actions proposed in the alternatives could adversely affect wetlands so this topic is retained for analysis.

Soundscapes. Both the National Park Service Organic Act (as amended) and NPS *Management Policies 2006* identify natural sound environments or soundscapes as a park resource and value worthy of protection. NPS *Management Policies 2006* (4.9) describe soundscapes as follows. Park natural soundscape resources encompass all the natural sounds that occur in parks, including the physical capacity for transmitting those natural sounds and the interrelationships among park natural sounds of different frequencies and volumes. Natural sounds occur within and beyond the range of sounds that humans can perceive, and they can be transmitted through air, water, or solid materials. Some examples of natural sounds include sounds produced by birds, frogs, or katydids to define territories or help attract mates; sounds produced by bats or porpoises to find prey or navigate; sounds received by mice or deer to detect and avoid predators; sounds produced by physical processes, such as wind in the trees, claps of thunder, or falling water. The management policies specifically state that the National Park Service "will preserve, to the greatest extent possible, the natural soundscapes of parks." The policies further state that NPS staff will

restore degraded soundscapes to the natural condition whenever possible and will protect natural soundscapes from degradation due to noise (undesirable human-caused sound). Noise can adversely affect, directly and indirectly, the natural soundscape and other park resources. Noise can also adversely impact visitor experience.

Visitors to Biscayne National Park have opportunities to experience tranquility in an environment of natural sounds in many parts of the park. Actions in the alternatives that could potentially increase noise levels in parts of the park, such as enhanced development of visitor destination points and increasing the level of visitor services, facilities, and access, could be of concern to some visitors, the general public, and NPS managers. Therefore, this topic is retained for analysis.

Cultural Resources

The National Park Service categorizes cultural resources as archeological resources, cultural landscapes, historic structures, museum collections, and ethnographic resources. Cultural resource impact topics were selected on the basis of fundamental resources and values identified in the park's enabling legislation; major values identified during the plan's scoping process; and applicable laws, executive orders, and regulations as well as NPS management policies and guidelines. The National Historic Preservation Act, Archaeological Resources Protection Act, Native American Graves Protection and Repatriation Act, National Environmental Policy Act, and other legislation require that the effects of any federal undertakings on cultural resources be examined and analyzed. Also, NPS *Management Policies 2006* and Director's Order 28: *Cultural Resource Management* call for consideration of the effects of planning proposals on cultural resources. Actions proposed in this plan could affect archeological resources, historic structures, and cultural landscapes. The rationale for dismissing museum collections and ethnographic resources from further consideration is found in the next section under "Impact Topics Dismissed from further Consideration."

Visitor Use and Experience

The planning team identified visitor experience as an important issue that could be appreciably affected under the alternatives. The Organic Act and NPS *Management Policies 2006* direct the National Park Service to provide enjoyment opportunities for visitors that are uniquely suited and appropriate to the resources found in the park. Different aspects of visitation and enjoyment are evaluated by alternative: visitor uses, recreational opportunities, access to information and interpretation, visitor facilities, and visitor access.

Park Operations

Operations and Facilities. The alternatives proposed in this plan could affect park operations and facilities. Topics include staffing, maintenance, facilities, ability to protect park values and visitors, employee and visitor health and safety, management of natural and cultural resources, and administrative access. Therefore, operations and facilities are retained for analysis.

Concessions. Actions proposed in the alternatives could adversely or beneficially affect park concessioners. For example, establishing user capacity, establishing zones that limit types of use, or other requirements could affect concessioners. This, in turn, could affect the experience of clients and other visitors in the park. Therefore, concessions is retained for analysis.

Socioeconomic Environment

The National Environmental Policy Act requires an examination of social and economic impacts caused by federal actions.

Biscayne National Park affects the socioeconomics of nearby communities such as Homestead and southeastern portions of the greater Miami metropolitan area. Accordingly, residents and tourism-related businesses (e.g., restaurants and hotels) in the region are concerned about changes in management of the park that might affect their lives and socioeconomic environment and opportunities. Impact topics include the effects that park operations and visitation have on the regional economy.

IMPACT TOPICS DISMISSED FROM FURTHER CONSIDERATION

Some impact topics that commonly are considered during the planning process were not relevant to the development of this general management plan for Biscayne National Park because of the following: (1) implementing the alternatives would have no effect or a negligible effect on the topic or resource or, (2) the resource does not occur in the national park. The following topics were dismissed from further consideration.

Natural Resources

Prime and Unique Farmlands. According to the Natural Resource Conservation Service, U.S. Department of Agriculture, there are no prime or unique farmlands in Biscayne National Park, so this topic is dismissed from further analysis in this document.

Floodplains. NPS management policies and Executive Order 11988, "Floodplain Management" require addressing impacts on and development in natural floodplains. The entire park is within the regulatory 100-year floodplain. Some of the alternatives propose new development in the floodplain. This development includes dock improvements, construction of boardwalks, and in alternatives 2, 3, 4, 6, 7, and 8 hardening portions of trails on Elliott Key. The dock improvements and boardwalks would not impact floodplain processes, nor would they increase the potential for erosion after construction. Hardening the trail on Elliott Key would add an impervious surface area on the highest point of the island. The trail is unlikely to increase the potential for erosion or to substantially modify the drainage pattern on the island because the trees surrounding the trail would remain to stabilize surrounding soils. Short-term impacts would be adverse but negligible. Long-term impacts, after construction, would also be adverse but would continue to be negligible. Because no impacts are anticipated to be greater than negligible, this topic is dismissed from further analysis in this document.

Air Quality. According to the Clean Air Act, Biscayne National Park is in a class II airshed. Activities in the park that could contribute to air pollution in the region include boat traffic in Biscayne Bay, park vehicles, and private vehicles. These activities would not be expected to increase as part of this plan. Some proposed actions in the park could decrease local air quality in the short term. These actions include development of visitor facilities on the Keys, particularly in alternatives 2 and 3—in particular, there could be an increase in dust and other particulate matter during construction. These impacts could be reduced through use of best management practices to reduce the impacts of proposed development on air quality. With these mitigation measures, the alternatives being considered in this document would result in negligible effects on air quality in both the short and long term. Therefore, air quality is dismissed from further analysis in this document.

Wilderness and Wild and Scenic Rivers. Wilderness and wild and scenic rivers are congressional designations designed to protect undeveloped areas and free-flowing rivers. A wilderness review was called for in Public Law 96-287 of 1980 and a wilderness eligibility assessment was completed in 1983. There are no designated wild and scenic rivers and no designated wilderness in Biscayne National Park. No actions proposed in this

plan would adversely impact future designation of any rivers or areas that might be suitable for such designations within the region. Additional wilderness planning needs will be identified in the future park foundation document. Therefore, wilderness and wild and scenic rivers are dismissed from further analysis in this document.

Water Resources.

Water Quality in the Bay— The park's water quality issues result from human-caused influences and proximity to millions of people in the Biscayne Bay watershed. Water quality issues for the park are primarily water clarity, nutrient loading and enrichment, bacterial enrichment due to sewage input, unregulated classes of chemical compounds derived from both sewage and industrial uses that are commonly called environmental pollutants of concern or microconstituents, pesticides, and more traditional industrial and stormwater pollutants (BBPI 2001; Miami-Dade Government / WASD Website; Lietz and Meyer 2006; Ecology and Environment 2007). These compounds generally occur through groundwater seepage, canal inflow, surface runoff, or direct release by boats (Alleman et al. 1995; BBPI 2001).

The hydrogeology of Miami-Dade County results in the rapid movement of groundwater with direct subsurface connection to the bay and canals through the unconfined Biscayne Aquifer (Klein and Hull 1978; Lietz 1999). Stormwater and surface water runoff are routed to canals as overland flow or via subsurface infiltration and can move directly into the bay or indirectly as inflow to groundwater with storm-driven flow carrying the most diverse collection of compounds, including fecal coliform bacteria, nutrients, pesticides, herbicides, petroleum byproducts, chlorinated solvents, metals, wastewater compounds, and sediment (Migliaccio and Castro 2009; Alleman et al. 1995; BBPI 2001; Caccia and Boyer 2005, 2007). In addition to terrestrial sources, the large number of private boaters using the bay and ocean waters has the potential to discharge sewage and bilge water directly into park waters, which includes oil, grease, fuel, hydrocarbon contaminants, and sewage from marine heads (bathrooms). The overall impact from direct marine discharge may be minimal on a loading basis because of volume; however, because of the mobile nature of the source, it will be determined and concentrated by boater use patterns and the ability to reach normally isolated areas.

During an extensive review of issues affecting Biscayne Bay, a multiagency, multi-stakeholder team (the Biscayne Bay Partnership Initiative) reviewed issues affecting water quality, which resulted in the following findings:

> *Canal inflow is the primary mechanism for pollutant delivery to the bay. Groundwater nutrient inputs to the bay are more prevalent in the Southern Bay. An increase in nutrient loading is correlated to an increase in population density (Caccia and Boyer 2007). Pollutant loading to the bay can increase substantially during storm events (Briceno et al. 2010; Migliaccio and Castro 2009). In addition, nutrient loading to the bay appears to be affected by climatic cycles with an observed increase in loading rates in wetter years and lower loading rates in drier years (Caccia and Boyer 2007). Sustained increases in fecal coliform levels have been observed in the Southern Bay (Migliaccio and Carey 2008). Whereas, chlorophyll-a concentrations have demonstrated an increasing trend throughout the entire bay (Migliaccio and Carey 2008). Mowry Canal and Princeton Canal represent the largest source of nitrate loading to Biscayne Bay and have the highest flow-weighted mean concentrations of all canals discharging into Biscayne Bay (Caccia and Boyer 2005). Mowry Canal and Princeton Canal discharges have led to nutrient enrichment imbalances that have resulted in flora and fauna disturbances in Biscayne Bay, in the*

vicinity of these canals (Graves et al. 2005; Szmant 1987). Likewise, Arch Creek, Miami Canal, and Tamiami Canals have exhibited a decline in water quality due to elevated nutrient concentrations (Lietz 1999). In addition, many Miami-Dade canals are determined to be impaired as per the FDEP's 303(d) list, including Military Canal, which drains the Homestead Air Reserve Base (an USEPA superfund site) (FDEP 2010a).

Biscayne Bay is affected by atmospheric conditions and there are seasonal changes in rainfall, temperature, and salinity. Seasonal salinity patterns in the bay highlight three broad regions with respect to magnitude and variability of salinity. The first region is in the eastern bay adjacent to the Atlantic Ocean and is characterized by near oceanic salinities that vary little throughout the year. The mid-basin region shows variability during the wet and dry seasons, having somewhat lower than average salinities during the peak wet season because of increased freshwater inflow (July–September). The third broad area is on the western side of the bay, which is a lower salinity region with high variability caused by the freshwater discharges from drainage canals (Ault et al. 2001).

Biscayne Bay's water quality has been the subject of monitoring and study for many decades. In the late 1970s, the Miami-Dade County Environmental Resources Management Department, with the support of the state, established a network of surface water monitoring stations in the bay. Florida International University, the U.S. Geological Survey (USGS), the NOAA Fisheries, and the National Park Service are also conducting additional monitoring. Sediment chemistry studies have also been conducted by various entities during the past 20 years.

The state has designated the bay and its natural tributaries as "Outstanding Florida Waters," and as such the bay receives the highest level of protection from degradation. During the past 40 years, water quality in the bay has improved substantially. Water quality generally meets federal, state, and local standards for recreational uses and propagation of fish and wildlife. However, portions of the bay have been substantially affected by past development and water management practices. Loss of coastal wetlands and seagrass communities has contributed to changes in the physical and ecological water quality characteristics.

Some actions proposed under this plan would have adverse impacts on water quality in the bay such as construction of boardwalks and dock improvements and changing the level of boating access to certain marine areas. The impacts on water quality from construction activities would primarily result from disturbances to sediment, which increases turbidity in the water column. The impact of increased turbidity on resources in the bay, such as the seagrass beds, would be mitigated by undertaking construction activities in the winter months when the seagrass beds are the least productive. These impacts would be localized, limited to the construction period, negligible to minor, and adverse.

Because most effects on water quality originate outside NPS control and there would be no impacts of moderate or greater intensity from any action in this general management plan, water quality in the bay is dismissed from further analysis in this document.

Surface Water Flow— Surface water (freshwater) inflow is a primary factor that determines species community structure, distribution, and composition in Biscayne Bay. Historically, water entered the bay as it flowed over the land, entering the bay over most of the shoreline. Biscayne Bay has undergone dramatic changes in environmental conditions because of human alteration of natural hydrologic conditions in southern Florida (Ault et al. 2001). Water flow into the western portion of the bay has been heavily altered by construction of 19 water management canals that drained wetlands and released water in pulses to prevent flooding and to facilitate

drainage. The alterations in the amount, timing, and distribution of freshwater flowing into coastal marine waters has changed the temperature, salinity, and nutrient regimes and degraded estuarine and nearshore marine habitats (Serafy et al. 1997; South Florida Water Management District 1995).

For example, the canals create unnatural freshwater discharge points into the bay. After storms, large amounts of freshwater move into the western portion of the bay from these 19 discharge points. Fish kills, benthic community die-offs, and turbidity plumes are associated with these large pulses of freshwater following major storms. The alteration of increased salinity along the western edge of the bay has been attributed to the reduction in the number of some mollusk species, including *Milonga, Neritina,* and *Melampus* (NPS 1993).

No proposed action in this plan would alter the surface water flow regime into the waters of Biscayne Bay because surface water sources originate outside park boundaries and they are managed by other entities. Therefore, surface water is dismissed from further analysis in this document. The National Park Service is working with the South Florida Water Management District and Miami-Dade County to determine if wastewater reuse can be treated to levels that would be clean enough to hydrate the park's coastal wetlands.

Groundwater— The source of the groundwater flow into the bay is the Biscayne Aquifer, which underlies lower southeastern Florida and extends beneath Biscayne Bay. Water quality in the aquifer is threatened by both terrestrial sources and saltwater intrusion that results from changes in water flow characteristics. Data from the Biscayne National Park Long-Term Hydrographic Project indicate that groundwater is seeping into offshore coral reefs on a tidal cycle. Terrestrial sources of pollution could then impact marine reef systems because of the groundwater connection. Historically, freshwater springs were on the shoreline of Biscayne Bay. As a result of hydrological changes in South Florida, these springs generally no longer flow. This presents a particular water quality management challenge because this aquifer provides the only source of drinking water from Boca Raton to the Keys. The park has concerns related to groundwater quality and its impact on park resources.

The park will continue to work with management entities to improve the quality of groundwater flow entering the park. None of the actions proposed in this plan would increase the potential for groundwater contamination from terrestrial sources or saltwater intrusion. These potential sources of groundwater contamination originate outside the park, and no actions proposed in this management plan would affect these sources. For this reason, groundwater is dismissed from further analysis in this document.

Wildlife. Most wildlife species found in the park are associated with the ocean or shoreline habitats, which includes mammals, birds, reptiles, and invertebrates.

Mammals— There are 28 species of mammals in the park. Most of these species are small rodents although bobcat, raccoon, and striped skunk are also found in the park. The population of all mammals within the park appears to be stable, with the exception of bobcats because sightings of bobcats have declined. Some actions in this plan could have an adverse impact on resident mammals in the park, particularly those that live on the Keys. These proposed actions include development of visitor facilities, which could attract some animals because of the potential availability of food. If individual animals become habituated to food associated with park facilities, this could be a hazard for both the animals and visitors. The park will implement measures to reduce the amount of food available to animals in the park from human sources. These measures could include, but are not limited to, timely removal of trash from the park as well as installation of rodent-proof trash receptacles. With mitigation, the impacts of this plan on the resident terrestrial mammal

population would be negligible. Therefore, the potential impacts on these species is dismissed from further analysis in this document.

Marine Wildlife— Three marine mammal species reside in the park. Manatees, river otters, and Atlantic bottlenose dolphins are full-time park residents. Occasionally, park staff have observed whales outside the boundaries, but the water in the park is too shallow for whales to inhabit the park.

A large diversity of crustaceans occur in the park, although only a limited number of shrimp, lobster, and crab species are managed as fishery-targeted species.

Management of the above species is governed by state and federal laws. None of the proposed alternatives in this plan would alter management actions or obligations of the U.S. government or the National Park Service relative to these species in the park. Therefore, this topic is dismissed from further analysis in this document.

The manatee, a federally listed endangered species, is also found in the park. The impacts of this plan on manatees and their habitat are analyzed in the section on threatened and endangered species.

Cultural Resources

Ethnographic Resources. Ethnographic resources are defined by the National Park Service as any "site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it" (Director's Order 28: *Cultural Resource Management*, 181). Ethnographic resources was dismissed as an impact topic because to date no ethnographic resources or ethnographic landscapes have been identified in Biscayne National Park, and no traditional cultural properties in the park have been listed or been determined eligible for listing, in the National Register of Historic Places.

The *Biscayne National Park Ethnographic Overview and Assessment* (EDAW 2003) provided an overview of groups shown to have traditional associations with Biscayne National Park. These groups included recreational and commercial fishers, the boating community, recreational divers, people with connections to Stiltsville, tow boat operators, environmentalists, the Seminole Tribe of Florida, the Miccosukee Tribe of Indians, South Florida African Americans, and descendants of families of homesteaders and other former island residents and landowners.

While no specific ethnographic landscapes were identified in the overview and assessment, there are specific places in the park that are important to members of these groups. Some of these include Stiltsville, the Israel Lafayette "Parson" Jones homesite on Porgy Key and associated farmstead on Totten Key, and prehistoric American Indian archeological sites. All of these resources are protected by existing policies, law, and regulations and the National Park Service will strive through ongoing consultations to develop and accomplish park programs in a way that respects the beliefs, traditions, and other cultural values of all identified groups who have ancestral or traditional ties to park lands.

Museum Collections. As of September 20, 2014, Biscayne National Park museum collections consist of an estimated 1,002,751 objects, specimens, and archival documents. These collections represent the disciplines of archeology (43,068), ethnology (259), history (469), archives (952,115), biology (5,843), and geology (997). The vast majority of the park's archives are resource management records that document park resources, management actions, and research by NPS and non-NPS scientists. Artifacts and specimens collected under scientific research and collecting permits of other legal instruments are also highly significant. The collection represents

an irreplaceable and invaluable resource for park managers and staff, researchers, and the general public.

The Biscayne National Park museum collection is managed by the South Florida Collections Management Center (SFCMC). The multipark museum program, based at Everglades National Park, manages the museum collections for Big Cypress National Preserve, Biscayne National Park, De Soto National Memorial, Dry Tortugas National Park, and Everglades National Park. The mission of the program is to preserve the diverse cultural and natural resources of these parks, sharing them with the American people in celebration of the collective heritage of the United States. The SFCMC curator is also the curator for Biscayne National Park and the designated custodial officer for the collection. The SFCMC staff, including the registrar, archivist, and technicians, provides high-quality, professional museum collection management services, ensuring that the park's collections are accessioned and cataloged, preserved, protected, and made available for access and use according to legal requirements and NPS policies and guidelines.

The South Florida Collections Management Center uses other museum storage repositories as appropriate to meet NPS collection management needs. As of January 2015, some of Biscayne National Park's museum collections are on loan to repositories such as: the NPS Southeast Archeological Center in Tallahassee, Florida; Florida Museum of Natural History in Gainesville, Florida; Fairchild Tropical Botanic Garden in Coral Gables, Florida; Florida International University in Miami, Florida; University of Miami in Coral Gables, Florida; University of California-Davis in Davis, California; U.S. Geological Survey in Davie, Florida; U.S. Geological Survey Center for Marine and Coastal Studies in St. Petersburg, Florida; U.S. Geological Survey National Center in Reston, Virginia; National Marine Fisheries Service in Miami, Florida; Missouri Botanical Gardens in Saint Louis, Missouri; New York State Museum Herbarium in Albany, New York; Brooklyn Botanic Garden Herbarium in Brooklyn, New York; University of South Florida Herbarium in Tampa, Florida; and the University of Michigan Herbarium in Ann Arbor, Michigan, among others. In addition, project archives associated with submerged archeological sites in Biscayne National Park are at the NPS Submerged Resources Center in Lakewood, Colorado, and archived at the Western Archeological and Conservation Center in Tucson, Arizona.

Museum collections are on exhibit at Biscayne National Park in the Dante Fascell Visitor Center. Collections may also be made accessible through research requests, in the NPS Web Catalog, in publications, on NPS websites, through social media, and through other exhibits at NPS and non-NPS museums.

Although the superintendent remains the accountable officer for the collection, the museum collection is dismissed as an impact topic from further analysis in this document because none of the alternatives considered in this plan would affect the preservation or management of the collections.

Indian Trust Resources. Secretarial Order 3175 requires that any anticipated impacts on Indian trust resources from a proposed project or action by agencies of the Department of the Interior be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes.

According to the NPS American Indian Liaison Office's list of National Parks, Tribal Trust Land, and Indian Reservations, there are no Indian trust resources in Biscayne National Park. The lands comprising the park are not held in trust by the Secretary of the Interior for the benefit of Indians because of their status as Indians. Therefore, Indian trust

resources is dismissed from further analysis in this document.

Other Topics

Natural or Depletable Resource Requirements and Conservation Potential. None of the alternatives being considered would result in the extraction of resources (with the exception of fish) from the park. Under all of the alternatives, ecological principles would be applied to ensure that the park's natural resources were maintained and not impaired. Therefore, this topic is dismissed from further analysis in this document.

Energy Requirements and Conservation Potential. The action alternatives would result in a negligible change in energy consumption compared to current conditions. The National Park Service would pursue sustainable practices whenever possible in all decisions regarding park operations, facilities management, and development in Biscayne National Park. Whenever possible, the National Park Service would use energy conservation technologies and renewable energy sources. Because the change in energy consumption at the park under any proposed alternative would be negligible, this topic is dismissed from further analysis in this document.

Public Health and Safety. The proposed developments and actions in the alternatives would not result in any identifiable adverse impacts on human health or safety. The alternatives were designed to take these factors into consideration and to remove them wherever possible; therefore, this topic is dismissed from further analysis in this document.

Environmental Justice. On February 11, 1994, President Clinton signed Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." This order requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs/policies on minorities and low-income populations and communities. The Secretary of the Interior established Department of the Interior policy under this order in an August 17, 1994, memorandum. This memorandum directs all bureau and office heads to consider the impacts of their actions and inactions on minority and low-income populations and communities; to consider the equity of the distribution of benefits and risks of those decisions; and to ensure meaningful participation by minority and low-income populations in the department's wide range of activities where health and safety are involved.

For fulfilling Executive Order 12898, in the context of the National Environmental Policy Act, the planning team assessed the alternatives presented in this plan during the planning process and determined that none of these alternatives would result in substantial direct or indirect negative effects on any minority or low-income population or community as defined in the Environmental Protection Agency *Environmental Justice Guidance* (1998).

The following information contributed to this conclusion:

- The developments and actions in the alternatives would not result in any identifiable human health effects. Therefore, there would be no direct or indirect effects on human health within any minority or low-income population or community.
- The impacts on the natural and physical environment that would occur because of any actions proposed in the alternatives would not disproportionately adversely affect any minority or low-income population or community, or be

specific to such populations or communities.

- The proposed alternative actions would not result in any identified effects that would be specific to any minority or low-income community.
- The park staff has consulted and worked with the affected American Indian tribes in cooperative efforts to manage the recreational potential of the park and its resources effectively and will continue to do so. No adverse effects were identified that disproportionately affect the tribes.

The topic of environmental justice is dismissed from further analysis in this document.

Relationships between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity. Under any alternative, the National Park Service would continue to maintain natural ecological processes and native biological communities wherever feasible. Under alternatives 2, 3, 4, 6, 7, and 8 (final preferred hybrid of alternatives 4 and 6) there would be a slight increase in the park's development footprint from the construction or upgrade of new trails and facilities. This footprint change would be so small (1 to 3 acres total) that it would not result in a substantial loss of long-term productivity. Natural resource management actions to increase ecosystem health would continue or be enhanced in all action alternatives, which would increase long-term productivity. Because there would be no substantial change in the relationship between short-term uses of the environment and long-term productivity, this topic is dismissed from further analysis in this document.

CHAPTER 2
Alternatives

INTRODUCTION

Many aspects of the desired future condition of Biscayne National Park are defined in the establishing legislation, the park's purpose and significance statements, and the servicewide mandates and policies that were briefly described earlier and are detailed in appendix B. Within these parameters, the National Park Service solicited input during scoping sessions and workshops (2001, 2003, and 2009) from the public, NPS staff, government agencies, tribal officials, and other organizations regarding issues and desired conditions for the park. Planning team members gathered information about existing visitor use and the condition of park facilities and resources. They considered which areas of the park attract visitors and which areas have sensitive resources.

Using the above information, the planning team developed a set of 11 management zones and 8 alternatives to reflect the range of ideas proposed during scoping sessions. These management zones and alternatives are composed of alternatives 2 through 5 originally presented in the 2011 Draft Plan, alternatives 6 and 7 that were presented in the 2013 Supplemental Plan, and alternative 8 (final NPS preferred alternative and a hybrid of alternatives 4 and 6).

This chapter describes the management zones and the alternatives for managing Biscayne National Park for the next 15 to 20 years. It includes tables that summarize the key differences between the alternatives and the key differences in the impacts that are expected from implementing each alternative. (The summary of impacts table is based on the analysis in "Chapter 4: Environmental Consequences.") This chapter also describes mitigation measures that would be used to lessen or avoid impacts, the future studies that would be needed, and the environmentally preferable alternative.

USER CAPACITY

General management plans for national park system units, including Biscayne National Park, must address user capacity management. The National Park Service defines user capacity as the type and extent of visitor use that can be accommodated while sustaining the quality of a park unit's resources and visitor experience consistent with the park unit's purpose.

Managing user capacity in national parks is inherently complex and depends not only on the number of visitors, but also on where they go, what they do, and the "footprints" they leave behind. In managing for user capacity, park staff relies on a variety of management tools and strategies, rather than relying solely on regulating the number of people in a park. The ever-changing nature of visitor use in parks requires a deliberate and adaptive approach to user capacity management.

The foundations for making user capacity decisions in this general management plan are the park's purpose, significance, special mandates, and management zones. In addition, based on the desired conditions, indicators, and standards associated with visitor use are identified. These indicators and standards help assess changes in resource and social conditions related to human activity to ensure that desired conditions are being maintained. The planning team considered many potential issues and related indicators that would identify impacts of concern, and those described in the following table were considered the most salient given the importance and vulnerability of the resource or visitor experience affected by visitor use. The specific, measurable indicators are organized in the table by their associated broad issue (e.g., disturbance of viable fish populations, visitor experience/use conflicts). These indicators are applicable to some or all

of the management zones identified in the plan. The assigned zones where these indicators will be monitored and conditions compared to the standards are identified in the first column of the table.

Based on the desired conditions, indicators and standards are identified. An indicator is a measurable variable that can be used to track changes in resource and social conditions related to human activity so that existing conditions can be compared to desired conditions. A standard is the minimum acceptable condition for an indicator. The indicators and standards help translate the broader qualitative descriptions of desired conditions in the management zones into measurable conditions. As a result, park managers can track changes in resource conditions and visitor experience and provide a basis for determining whether desired conditions are being met. Monitoring the indicators and standards also helps NPS staff evaluate the effectiveness of management actions and provides a basis for informed management of visitor use.

For each indicator and standard, a range of relevant management actions are described that could be taken to maintain or restore desired conditions. For example, management actions may include providing information about low-impact recreational use and the principles of "Leave No Trace," directing visitors to designated facilities or areas; adding or altering facilities (e.g., trails, campsites) for containment of use to designated areas, directing visitors to lesser-used areas or off-peak times, restricting the types of recreation activities permitted, and/or reducing the amount of visitor use in certain areas.

User capacity decision making is a continuous process; decisions are adjusted based on monitoring the indicators and standards. Management actions are taken to minimize impacts when needed. Once indicators and standards are identified, they should generally not change in the future. However, as monitoring of the park's conditions continues, managers may decide to modify or add indicators if better ways are found to measure important changes in resource and social conditions. Information on NPS monitoring efforts, related visitor use management actions, and any changes to the indicators and standards would be available to the public.

Biscayne National Park is a popular, highly visited national park with extensive and diverse visitor opportunities. In addition, the park contains unique natural and cultural resources including coral reefs, seagrass, and submerged shipwrecks that are highly vulnerable to visitor use impacts. Further, visitor use opportunities largely occur over an extensive water resource that is without many designated visitor facilities and use areas that make regulating use levels, activities, and patterns difficult. Managing user capacity in this unique setting is highly challenging.

Given these challenges and limited staff and budgets, user capacity management must use funds and staff time efficiently, focus on areas of most concern within the park, and develop creative approaches with monitoring and management strategies.

This management plan will provide guidance for a long-term, comprehensive strategy to manage user capacity. This information will help guide the strategic use of limited park staff and funding regarding future user capacity management. This guidance includes the following components.

- The management zones, described later in this chapter in table 2, provide the basis for managing user capacity. Each zone prescribes desired resource conditions, visitor experience, and recreational opportunities for different areas of the park. The zones also prescribe the types and levels of developments necessary to support these conditions, experiences, and opportunities.
- The park's most pressing use-related resource and visitor experience concerns, given the park's purpose, desired conditions, and the

vulnerability of specific resources and values, will be identified. This helps NPS managers focus limited resources on the most important issues and related indicators.

- User capacity indicators and standards, assigned by zone, will be monitored in the future to determine if desired conditions are being met.
- A general description of related monitoring strategies will be provided.
- Representative examples of management strategies that could be used to avoid or minimize unacceptable impacts from visitor use will be identified.

Table 1 describes the user capacity indicators, standards, monitoring, and management strategies for Biscayne National Park. This information was developed after careful consideration of key aspects of desired resource conditions and visitor experience, public scoping information, relevant research studies, staff management experience, and other park data sources. The planning team considered many potential issues and related indicators that would identify impacts of concern, and those described in the table were considered the most salient given the importance and vulnerability of the resource or visitor experience affected by visitor use.

The priority resource indicators selected for the park are associated with the issues of disturbance of viable fish populations, damage to seagrass and coral reefs, impacts on submerged and land-based cultural resources, and visitor experience/use conflicts. The conditions of these resources are already being monitored in various forms, but the indicators identified in the table will help park staff track specific impacts on these resources resulting from visitor use.

Impacts on viable fish populations from fishing activities can include over harvesting, violations of fishing regulations, and marine debris. These types of impacts can have substantial effects on the abundance and diversity of targeted fish species, and they can also reduce the quality of fishing opportunities. Visitor use impacts on seagrass are mostly associated with anchor damage, vessel groundings, and intentional vessel beachings. These impacts can cause substantial loss of seagrass, which is a critical link in the proper functioning of the marine ecosystem. Impacts on coral reefs, such as broken, scoured, or displaced/stolen corals, are often a result of snorkeling and scuba diving activities, anchor damage, and vessel groundings. These impacts can affect the health of specific coral communities as well as having more far-reaching effects on the structure and diversity of coral species within the park. These impacts can also diminish the quality of snorkeling and scuba diving opportunities.

Visitor use impacts on land-based cultural resources include general wear on historic structures and some occurrences of looting and vandalism. Cultural resources are nonrenewable, so harmful impacts must be minimized to the extent possible. Submerged cultural resources are affected by many of the same issues as coral reefs in terms of snorkeling and scuba diving activities, anchor damage, vessel groundings, and theft/looting. These impacts can disturb important features of these resources as well as the protective layers of natural material concretion on the sites, both of which may cause a loss of site integrity over time.

The priority social indicators selected for Biscayne National Park are associated with the issue of use conflicts. This includes both water- and land-based concerns such as crowding, noise, competition for sites/facilities, and violations of regulations. The visitor activities near the degraded seagrass beds in the park are a focal area of concern related to some of these issues. These problems may affect visitors' abilities to experience high-quality recreational opportunities and could also affect visitor health and safety. Many of these concerns are already tracked to some degree through law

enforcement incident reports and recorded visitor complaints.

Many of the problems just noted, such as impacts on coral reefs and seagrass, are also highly influenced by regional and worldwide threats such as pollution, disease, and climate change. Isolating visitor use impacts on these resources is not easy and may seem less important than these other serious threats. However, managing visitor use impacts is still essential given that water-based recreation is increasingly popular in southeast Florida and throughout the country, so protecting desired conditions will only be more challenging in the future. Further, there are visitor management actions that can help minimize these impacts and provide tangible resource and social benefits (Sorice et al. 2007).

The standards selected for each indicator were based on best professional management judgment and the desired conditions, the park's baseline conditions for each indicator, relevant park-specific and national research studies, and NPS guidelines and standards.

The monitoring and management strategies included in table 1 provide a general description of the range of considerations for future monitoring and visitor management related to each indicator. The implementation of any specific management actions that affect visitor use will comply with the National Environmental Policy Act, the National Historic Preservation Act, and other relevant laws, regulations, and policies.

The park would continue general monitoring of use levels and patterns. In addition, the park would monitor these user capacity indicators. The rigor of monitoring the indicators (e.g., frequency of monitoring cycles, amount of geographic area monitored) may vary considerably depending on how close existing conditions are to the standards. If the existing conditions are far from exceeding the standard, the rigor of monitoring may be less than if the existing conditions are close to or trending toward the standards.

In addition, the initial phases of monitoring for the indicators/standards defined in table 1 would help park staff identify whether any revisions are needed. The initial testing of the indicators and standards would determine if the indicators are accurately measuring the conditions of concern and that the standards truly represent the minimally acceptable condition of the indicator. Park staff may decide to modify the indicators or standards and revise the monitoring program if better ways are found to measure changes resulting from visitor use. Most of these types of changes should be made within the first several years of initiating monitoring. After this initial testing period of monitoring indicators and standards, adjustments should not occur unless there is a compelling reason. Finally, if use levels and patterns change appreciably, the park might need to initiate additional monitoring of new indicators to ensure that desired conditions are protected. This iterative learning and refining process is the strength of the NPS user capacity management program because it can be adapted and improved as knowledge increases.

TABLE 1. USER CAPACITY INDICATORS AND STANDARDS

Assigned Zone	User Capacity Indicators	User Capacity Standards	Related Monitoring Strategies	Potential Management Strategies
Topic: Viable Fish Populations				
Multiuse Zone (water) Slow Speed Zone Access-by-Permit Zone Sensitive Underwater Archeological Zone	Harvest of regulated fish species Abundance and density of targeted fish species (those fish that are specifically sought such as species in the snapper-grouper complex) Fisher satisfaction rate	Harvest of regulated fish species is within legal regulations no less than 70% of the time Abundance and density of targeted fish species maintains or exceeds baseline values when GMP was implemented The fisher satisfaction survey indicates at least 70% satisfaction	Periodic fish surveys and harvest monitoring Visitor satisfaction survey questions pertaining to fish Survey of fisher satisfaction	Increased awareness of the fishing education course Greater enforcement of fishing regulations Greater efforts toward public education and awareness regarding fishing relations (e.g., recruit volunteers to assist; Spanish language efforts)
Marine Reserve Zone	Average size of targeted fish species Species diversity Abundance and density of targeted fish species	Average size of targeted fish species maintains or exceeds baseline values when zone was implemented Species diversity maintains or exceeds baseline values when zone was implemented Abundance and density of targeted fish species maintains or exceeds baseline values when zone was implemented	Periodic fish surveys Visitor satisfaction survey questions pertaining to fish	Greater enforcement of fishing limitations Greater efforts toward public education and awareness (e.g., recruit volunteers to assist; Spanish language efforts) Proper marking of the marine reserve zone

TABLE 1. USER CAPACITY INDICATORS AND STANDARDS

Assigned Zone	User Capacity Indicators	User Capacity Standards	Related Monitoring Strategies	Potential Management Strategies
Special Recreation Zone	Harvest of regulated fish species Abundance and density of targeted fish species (those fish that are specifically sought such as species in the snapper-grouper complex) Species diversity Fisher satisfaction rate	Harvest of regulated fish species is within legal regulations no less than 70% of the time Average size of targeted fish species maintains or exceeds baseline values when zone was implemented Species diversity maintains or exceeds baseline values when zone was implemented Abundance and density of targeted fish species maintains or exceeds baseline values when zone was implemented The fisher satisfaction survey indicates at least 70% satisfaction	Periodic fish surveys and harvest monitoring Visitor satisfaction survey questions pertaining to fish Survey of fisher satisfaction	Increased awareness of the fishing education course Greater enforcement of fishing regulations Greater efforts toward public education and awareness regarding fishing relations (e.g., recruit volunteers to assist; Spanish language efforts) Proper marking of the special recreation zone
Topic: Seagrass				
Multiuse Zone (water) Slow Speed Zone Access-by-Permit Zone Sensitive Underwater Archeological Zone Noncombustion Engine Use Zone Marine Reserve Zone Special Recreation Zone	Average number of new groundings per year Areal extent of seagrass beds	Average number of new groundings per year in seagrass beds does not exceed baseline values when zone was implemented Areal extent of seagrass beds maintains or exceeds baseline values when zone was implemented	Assess damage from reported and unreported groundings Look for unreported grounding sites Monitor restored sites Monitor visitor use (e.g., trailer counts, registered boater statistics, etc.)	Better marking of shallows Greater efforts toward public education and awareness (e.g., recruit volunteers to assist; Spanish language efforts; participate in marine fairs) Greater enforcement of violations and increased ranger response to groundings Monitor natural recovery Active restoration and monitoring (bird stakes, substrate restoration, seagrass transplanting)

TABLE 1. USER CAPACITY INDICATORS AND STANDARDS

Assigned Zone	User Capacity Indicators	User Capacity Standards	Related Monitoring Strategies	Potential Management Strategies
Topic: Coral Reefs				
Multiuse Zone (water) Sensitive Underwater Archeological Zone Marine Reserve Zone Special Recreation Zone *Note: There are no coral reefs in the other water-based zones*	Number of new reported and unreported reef groundings per year Areal extent of new reef groundings per year Fishing debris volume and coverage on coral reefs, seagrass beds, and submerged archeological sites	Number of new reported and unreported reef groundings per year does not exceed baseline values when zone was implemented Areal extent of new reef groundings per year does not exceed baseline values when zone was implemented Fishing debris volume and/or coverage does not exceed baseline values when zone is implemented	Damage assessment of groundings Visitor satisfaction survey questions pertaining to reef health Overflights to do boat counts Periodic assessments of fishing debris (e.g., during visual fish surveys)	Installation of mooring buoys Greater efforts toward public education and awareness (e.g., recruit volunteers to assist; Spanish language efforts) Reef restoration techniques as outlined in the park's Coral Reef Restoration Programmatic Environmental Impact Statement (in progress) Volunteer clean-up events for marine debris Marine debris removal as mitigation (e.g., derelict trap removal)
Marine Reserve Zone Special Recreation Zone	Visitor damage at sites within 1,000 feet of mooring buoys (damage includes broken coral, garbage associated with divers and snorkelers, and damage to submerged cultural resources)	No more than 5% increase in broken coral or garbage relative to initial assessment when mooring buoy was first installed	Periodic monitoring by park staff and volunteer observations of selected sites	Greater efforts toward public education and awareness (e.g., recruit volunteers to assist; Spanish language efforts) Enforcement of violations and increased ranger presence Relocate and phase in mooring buoys to allow active or passive restoration of corals Add mooring buoys to displace or diffuse impacts

TABLE 1. USER CAPACITY INDICATORS AND STANDARDS

Assigned Zone	User Capacity Indicators	User Capacity Standards	Related Monitoring Strategies	Potential Management Strategies
Topic: Cultural Resources				
Multiuse Zone (land) Visitor Services / Park Administration Zone	Change in facility condition as a result of visitor use (using the Facility Condition Index) Evidence of missing historical artifacts, defacement, or damage	No more than a Facility Condition Index change of 1% from established baseline of all structures when GMP was implemented No missing historical artifacts, defacement, or damage	Annual condition assessments and regular inspections by maintenance personnel with work orders created to track deferred maintenance	Greater efforts toward public education and awareness regarding resource sensitivities and the need for appropriate behaviors Enforcement of violations and increased ranger presence Modify regulations to reduce visitor conflicts
Multiuse Zone (water) Nature Observation Zone Sensitive Underwater Archeological Zone Special Recreation Zone	Number of shipwreck cleanups required to maintain sites Percent increase in the debris field as a result of visitor use Evidence of missing historical artifacts, defacement, or damage	No more than two cleanups per assessment period No more than a 5% increase in the debris field relative to the annual assessment when the GMP was implemented No missing archeological artifacts, defacement, or damage No damage to submerged cultural resources	Regular monitoring by annual condition assessments Periodic monitoring by park staff and volunteer observations of selected sites Reinspection after storms to start new baseline for reference of visitor impact	Greater efforts toward public education to encourage voluntary redistribution of use Enforcement of violations and increased ranger presence Regulate use levels and patterns (e.g., institute a permitting or reservation system, limit group sizes) Document submerged cultural resources and consult with state historic preservation office
Multiuse Zone (land) Nature Observation Zone Special Recreation Zone	Percent increase in the debris field as a result of visitor use Evidence of missing historical artifacts, defacement, or damage	No more than a 5% increase of the debris field relative to the annual assessment when the GMP was implemented No missing archeological artifacts, defacement, or damage	Regular monitoring by annual condition assessments Periodic monitoring by park staff and volunteer observations of selected sites Reinspection after storms to start new baseline for reference of visitor impact	Greater efforts toward public education and awareness regarding resource sensitivities and the need for appropriate behaviors Enforcement of violations and increased ranger presence Regulate use levels and patterns (e.g., institute a permitting system, designate single-use permits) Site closure as necessary to protect resources

TABLE 1. USER CAPACITY INDICATORS AND STANDARDS

Assigned Zone	User Capacity Indicators	User Capacity Standards	Related Monitoring Strategies	Potential Management Strategies
Marine Reserve Special Recreation Zone	Visitor damage at sites within 1,000 feet of mooring buoys (damage includes broken coral, garbage associated with divers and snorkelers, damaged submerged cultural resources)	No more than 5% increase in broken coral or garbage relative to initial assessment when mooring buoy was first installed; no damage to submerged cultural resources	Periodic monitoring by park staff and volunteer observations of selected sites	Greater efforts toward public education and awareness (e.g., recruit volunteers to assist; Spanish language efforts) Enforcement of violations and increased ranger presence Relocate mooring buoys to allow active or passive restoration of corals Add mooring buoys to displace or diffuse impacts Document submerged cultural resources and consult with state historic preservation office
Topic: Visitor Experience/Use Conflicts				
All zones	Number of incidents of user conflicts requiring law enforcement attention or intervention resulting in a case incident report / warning / citation	No more than five law enforcement incidents per day and an average of two per day on an annual basis	Continue existing tracking of case incidents	Greater efforts toward public education and awareness regarding visitor use etiquette and park regulations Greater enforcement of existing visitor use regulations and increased ranger presence Modify regulation as necessary to reduce visitor conflicts
Visitor Services / Park Administration Zone	Number of times visitor center parking lot has exceeded its physical capacity	Allowable once a month or during special events	Regular monitoring by park staff at the entrance gate	Greater efforts toward public education to encourage voluntary redistribution of use Explore ways to increase parking lot capacity through striping and parking time limitations Encourage carpooling to site via press releases/website Develop overflow parking area and use

TABLE 1. USER CAPACITY INDICATORS AND STANDARDS

Assigned Zone	User Capacity Indicators	User Capacity Standards	Related Monitoring Strategies	Potential Management Strategies
				when needed Develop and use alternative parking areas (e.g., adjacent to the park)
Visitor Services / Park Administration Zone	In the Boca Chita boat basin and the Elliott Key docks, number of times improper mooring occurs as a result of island marinas reaching capacity	No tolerance per Superintendent's Compendium	Periodic monitoring by park staff and volunteer observations of selected sites	Greater efforts toward public education to encourage voluntary redistribution of use Greater efforts toward public education regarding pertinent park regulations Greater enforcement of existing visitor use regulations Increased number of signs and information related to proper mooring locations and regulations
Visitor Services / Park Administration Zone	Number of times group camping exceeds limits	No more than once per month	Periodic monitoring by park staff and volunteer observations of selected sites	Greater efforts toward public education to encourage voluntary redistribution of use Greater enforcement of existing visitor use regulations and increased ranger presence
Visitor Services / Park Administration Zone	Number of times individual campsites are observed outside of the designated camping area	No more than once per week	Periodic monitoring by park staff and volunteer observations of selected sites	Greater efforts toward public education to encourage voluntary redistribution of use Greater efforts toward public education on camping policies Better delineation of existing campsites Greater enforcement of existing visitor use regulations and increased ranger presence

TABLE 1. USER CAPACITY INDICATORS AND STANDARDS

Assigned Zone	User Capacity Indicators	User Capacity Standards	Related Monitoring Strategies	Potential Management Strategies
All areas with mooring buoys	Number of complaints received that mooring buoy capacity is met and boats are unable to moor in their desired location	No more than 10 complaints per day	Continue existing tracking of complaints	Greater efforts toward public education to encourage voluntary redistribution of use Change the number and location of mooring buoys consistent with the Mooring Buoy and Marker Plan Greater enforcement of existing visitor use regulations Implement adaptive management strategies from the Mooring Buoy and Marker Plan

IDENTIFICATION OF THE FINAL NPS PREFERRED ALTERNATIVE

The full range of alternatives was developed from a number of different perspectives. This included comments received on the alternatives newsletter and during public scoping meetings and workshops, public and agency comments received on the 2011 Draft Plan, 2013 Supplemental Plan, and 2014 public workshops, cost estimates, analysis of potential impacts.

With these and other elements in mind, the National Park Service drafted the preferred alternative (alternative 8—the final NPS preferred alternative—a hybrid of alternatives 4 and 6), which balances resource protection, visitor experience, and interagency collaboration. Alternative 8 replaces the former agency preferred alternative 4 from the 2011 Draft Plan and alternative 6 from the 2013 Supplemental Plan.

The final NPS preferred alternative and the environmentally preferable alternative are not synonymous.

MANAGEMENT ZONES

The building blocks for reaching an approved plan for managing a national park system unit are the management zones and the alternatives. Both are developed within the scope of the park's purpose, significance, mandates, and legislation.

All lands within the park's legislated boundary are zoned regardless of whether or not the lands are currently owned in fee-simple title by the National Park Service. For lands not currently owned, zoning provides direction for future management should such lands be acquired.

Management zoning is a set of descriptions for desired conditions of park resources and visitor experiences in different areas of the park. The management zone descriptions identify the widest range of potential, appropriate resource conditions, visitor experiences, and facilities for the park in that area.

Each of the alternatives has an overall management concept and a description of how different areas of the park would be managed (management zones and related actions). The action alternatives represent different ways to apply the management zones to the park.

Zones were initially developed in an interdisciplinary workshop. Existing conditions were analyzed. Where existing management directions were determined to be appropriate for protecting park resources and providing for visitor enjoyment, zones were used to refine and formalize those management prescriptions. For example, existing slow speed zones are planned for areas where there are visitor safety concerns or to protect manatees along the park's western shore.

These alternatives embody the range of park operations the public and the National Park Service want to see approved regarding natural resource conditions, cultural resource conditions, visitor use and experience, park operations, and the socioeconomic environment.

Zoning schemes also considered current and future needs for resource protection. Sensitive resources, such as state and federally listed species and cultural resources, were carefully analyzed to determine what management prescription would best protect those resources for the long term. A deliberate effort was made to create management zones that are consistent with approved conservation plans (e.g., *Dade County Manatee Protection Plan* [1996] and *A Species Action Plan for Six Imperiled Wading Birds* [2013]). Best available science was used to inform zoning decisions so that the resources of Biscayne National Park are managed in the context of a larger landscape so that NPS efforts contribute to interagency landscape-scale resource conservation goals.

Zoning was then considered in relation to visitor experience, visitor use, and visitor conflicts. Where possible, zoning was applied to minimize visitor conflicts and to separate inherently incompatible uses.

Zoning names used by other agencies in the vicinity of the park were also considered for use in this general management plan. The names and descriptions ultimately used in this plan are consistent with NPS policy and direction regarding zoning.

The management zones were first presented to the public in *Biscayne National Park General Management Plan Newsletter 3* and were modified in response to public and agency comments.

There were 10 management zones in the 2011 Draft Plan. A new zone (the special recreation zone) was included in the 2013 Supplemental Plan as part of alternative 6 and alternative 7. This *Final General Management Plan / Environmental Impact Statement* includes the same 11 management zones presented in the 2013 Supplemental Plan and a new management zone: "Idle Speed Zone (no wake)" pertaining to alternative 8.

TABLE 2. BISCAYNE NATIONAL PARK MANAGEMENT ZONES

	Resource Condition	Visitor Experience	Management Actions and Facilities
Marine Reserve Zone (Alternatives 3, 4, 5, and 8)	The marine reserve zone would provide a high level of protection from direct human-caused impacts for water-based ecosystems, habitats, and processes while allowing visitors to experience the zone. Natural processes occur with negligible disturbance from human use. This zone would protect natural resources such as marine nursery areas and coral reefs. The marine reserve zone would provide the opportunity to compare the resource status of an area with no extractive uses to other areas allowing removal of resources. 1. Natural processes would predominate. 2. Resource impacts would be reduced significantly. 3. Most lasting signs of human use would not be apparent. Evidence of human impact would be restricted to cultural resources such as historic shipwrecks. 4. Intervention and restoration could occur to mitigate and stabilize human-caused disruption or for resource management purposes. Otherwise alterations to natural resources would not occur. 5. The significance and vulnerability of cultural resources would be evaluated, and appropriate management actions would be determined.	Visitors would be immersed in nature with opportunities to experience natural sounds, tranquility, solitude, and closeness to nature. Visitors would have opportunities to observe and learn about the differences and benefits to resources of a nonextractive use area compared to areas allowing removal of resources Research activities would continue to be allowed under the NPS permit process or by the National Park Service, consistent with all park areas. 1. Appropriate visitor activities could include boating, sightseeing, nature-watching, mooring, swimming, snorkeling, and scuba diving. Commercial and recreational fishing would not be allowed, except for lionfish harvest. Anchoring would not be allowed. 2. Visitors would be self-reliant and have maximum opportunities to experience a sense of discovery and adventure. Application of outdoor skills would be essential. 3. Interaction with nature would predominate, with only occasional encounters with others. There would be a sense of relative remoteness. The sights and sounds of nature would be more prevalent than those of human activities. Visitor activities would be mostly self-directed and have negligible resource impacts. 4. Special events, with the exception of cleanup events or citizen science, would generally not be allowed. 5. Visitors would benefit from research by learning about protected resources. 6. Limited commercial services that provide appropriate visitor recreational activities might be allowed if compatible with resource protection goals and desired visitor experience.	Management actions would focus on the preservation and protection of water-based ecosystems, habitats, and processes. Appropriate management actions could include 1. determining types and levels of use considering the desired visitor experience and the vulnerability of resources to impacts 2. intervening and restoring natural resources to mitigate and stabilize human-caused disruption 3. conducting research aimed at monitoring resource conditions and understanding natural processes 4. prioritizing, overseeing, and managing research projects 5. taking measures to prevent human-caused impacts 6. defining additional compatible uses Facilities generally would not be appropriate, except when determined they would enhance resource protection or public safety. Facilities could include 1. signs, mooring buoys, and navigational aids 2. research equipment—if installed, research apparatus would be minimal and unobtrusive; if research could be accomplished in another management zone, it would not occur in the marine reserve zone

TABLE 2. BISCAYNE NATIONAL PARK MANAGEMENT ZONES

	Resource Condition	Visitor Experience	Management Actions and Facilities
Visitor Services / Park Administration Zone (All Alternatives)	This zone would provide for a high level of visitor activity and administrative operations. The zone would be modified for visitor access and park operations in a way that aesthetically blends with the natural and cultural environment. 1. Elements of the natural and cultural environment would remain. 2. Sights and sounds of human activity would frequently supplant the sights and sounds of nature. 3. There would be tolerance for some resource impacts to accommodate visitor services and park operations. 4. New development of park administrative facilities would occur only on previously disturbed sites. Some development for visitor access and activities might occur. The zone would not be near sensitive natural or cultural resources if such resources could not be adequately protected. 5. The significance and vulnerability of cultural resources would be evaluated, and appropriate management actions would be determined. Cultural resources might be stabilized and hardened (protecting archeological values from illegal artifact removal or other destructive activities) to permit visitor access or considered for adaptive reuse.	Visitors would have opportunities to receive orientation and information, interact with park staff, and experience and learn about park resources. 1. Appropriate visitor activities could include sightseeing, walking, swimming, recreational fishing, boating, camping, participating in educational activities, and interacting with resources. 2. Visitors would see native flora and fauna and might see cultural resources. 3. Interpretive and educational opportunities would be greatest in this zone. Visitor activities might be self-directed and/or visitors might use interpretive services to plan their activities. Visitor education could be self-directed or structured. 4. Interpretive services would be offered in multiple languages. 5. Special events could be allowed in this zone with appropriate permits. 6. The probability of encountering others would be high. Visitors would experience a modified environment that accommodates high levels of use and minimizes further resource impacts. 7. Facilities and services would enhance opportunities to experience and understand park resources and provide an orientation to the park. 8. Visitor activities might be highly regulated to preserve elements of the natural and cultural environment, allow access to cultural resources, prevent visitor conflicts, and enhance public safety. 9. Vessel type, size, and speed might be regulated to enhance resource protection and preserve the desired visitor experience. 10. Commercial visitor services and facilities would be appropriate in this zone.	Management actions would focus on managing the higher levels of visitor use within the zone and providing administrative services. Management actions could include 1. administering daily parkwide operations 2. providing maintenance activities 3. providing interpretive and enforcement services 4. providing emergency services 5. implementing resource stewardship 6. prioritizing, overseeing, and managing research projects 7. defining additional compatible uses 8. limiting public access to certain parts of this zone (housing, maintenance, and administration) 9. regulating visitor activities and vessel type, size, and speed authorizing commercial services 10. managing fishing activities Facilities would be appropriate in size and scale, blending with the natural and cultural landscape. Extent, size, and layout would be the minimum needed to accommodate the intended purposes. Existing and new visitor facilities or improvements would be analyzed for ongoing need, usefulness, and impacts on resources. New administrative facilities could be located outside park boundaries. 1. Appropriate visitor facilities could include visitor centers, kiosks, wayside exhibits, educational spaces, observation boardwalks, roads, parking areas, docks, restrooms, picnic areas, campgrounds, navigational aids, mooring buoys and trails improved and maintained as necessary for universal accessibility. 2. Appropriate park administrative facilities could include maintenance, storage, offices, and staff housing.

TABLE 2. BISCAYNE NATIONAL PARK MANAGEMENT ZONES

	Resource Condition	Visitor Experience	Management Actions and Facilities
Dredged Navigation Channels Zone (All Alternatives)	The purpose of this zone is to allow transportation routes for vessels in existing channels including the Intracoastal Waterway and the Black Point, Homestead Bayfront, and Turkey Point Channels. 1. Natural conditions and processes could be impacted by transportation use of the zone. 2. Unnatural sounds might be prevalent. 3. Resources within the dredged navigation channels would continue to be impacted by activities that maintain existing channels. Within the channels, some impacts on natural conditions would be tolerated. Impacts on resources outside the channels would be kept to an absolute minimum. 4. There could be a high level of human use and activity. 5. The existing depth, size, shape, location, and alignment of navigational channels would not be expanded, and no new channels would be created. Channels would not exceed the following existing depths within the park: Intracoastal Waterway: 7 feet Black Point Channel: 4.5 feet Homestead Bayfront Channel: 4.5 feet Turkey Point Channel: 7.5 feet 6. Channels would be marked with signs and navigational aids to protect resources and enhance public safety. 7. The significance and vulnerability of cultural resources would be evaluated, and appropriate management actions would be determined.	The visitor experience would involve moving along a marked navigational channel by water vessel and would be perceived as linear or sequential in nature. 1. Appropriate activities would be the use of channels for traveling through the park and/or gaining access to other park areas. 2. Visitor activity would be self-directed travel through or within the park at varying speeds. 3. Opportunities for discovery, challenge, and adventure could be low. Visitors would need to be self-reliant and possess navigational skills. 4. Visitors would benefit from learning about this zone and how to navigate safely within it. 5. Special events would not generally be allowed in this zone. 6. There could be a high probability of encountering other people in this zone. Visitors could expect to hear human-caused sounds. 7. Because of congested vessel traffic at times, conditions in the navigational channels could be dangerous. Visitors might encounter commercial ships and would need to exercise caution. Visitors would navigate through a well-marked channel of a specified depth. Use could be intensively managed and regulated to ensure safe passage and resource protection. 8. Vessel size would generally not be regulated, except by conditions of the channel. Speed of vessels in the Intracoastal Waterway would be at a pace that is appropriate to conditions and skill levels. 9. Commercial traffic could be allowed in this zone without the requirement of a permit.	Management activities would focus on resource protection and navigational aids to facilitate safe travel through and within the park. Appropriate management actions could include 1. regulating visitor activities 2. providing law enforcement services 3. monitoring resource impacts 4. managing these zones for transportation and public safety (there might be overlapping jurisdiction with other agencies; coordination and cooperation with other agencies would occur) 5. taking measures to prevent human-caused impacts 6. In most cases, other agencies are responsible for the dredging of these channels through existing agreements or commitments; therefore, implementation of this GMP would not affect those agreements (proposed dredging would need a site-specific environmental study and NPS approval) Facilities appropriate in these zones would include navigational aids and signs for resource protection and enhancing visitor safety.

TABLE 2. BISCAYNE NATIONAL PARK MANAGEMENT ZONES

	Resource Condition	Visitor Experience	Management Actions and Facilities
Multiuse Zone (Land and Water) (Alternatives 2, 3, 4, 5, 6, 7, and 8)	This zone would provide opportunities for visitors to recreate in natural or cultural settings. Natural and cultural scenes would remain largely intact. 1. Natural conditions and processes would predominate. The environment might be adapted for human use. 2. Sounds and sights of human activity might be apparent. 3. There would be tolerance for minimal resource impacts. 4. Additions to the landscape, including signs, buoys, and markers, might be used to enhance visitor experience and public safety and to protect resources. 5. The significance and vulnerability of cultural resources would be evaluated, and appropriate management actions would be determined. To permit visitor access, cultural resources might be stabilized and hardened (protecting archeological values from unauthorized artifact removal or other destructive activities).	Visitors would experience a natural or cultural setting, whether they are on the water, under the water, or on land. Providing opportunities for people to interact with the resources in this zone would be important. Visitor use of this zone would be resource-based recreation and education that is consistent with park purpose and significance. 1. Appropriate visitor activities could include sightseeing, boating, scuba diving, snorkeling, swimming, fishing (potentially with limitations on commercial fishing), nature-watching, hiking, picnicking, camping, and visiting cultural resources. 2. There would be opportunities for challenge, adventure, and discovery. Visitors might need to use outdoor skills and be self-reliant. 3. Visitor activities might be self-directed, or visitors might use interpretive services to plan their activities. 4. Special events could be allowed in this zone with the appropriate permit. 5. The probability of seeing or encountering others would range from low to moderate most of the time. 6. Occasional special events might result in high levels of visitor encounters for short periods. 7. Visitor activities might be limited to protect resources and enhance public safety. Limitations might be short or long term. 8. Vessel type, size, and speed could be regulated to enhance resource protection and public safety and preserve the desired visitor experience.	Management actions would focus on enhancing visitor experience and safety, protecting resources, minimizing impacts from visitor and commercial use, and restoring disturbed areas. Appropriate management actions could include 1. determining types and levels of use by considering the desired visitor experience and resource vulnerability to impact 2. managing access based on the determined user capacity 3. inventorying and monitoring resources 4. providing interpretation and enforcement services 5. conducting research and restoring and stabilizing resources 6. minimizing and mitigating impacts from visitor and commercial use 7. defining additional compatible uses 8. managing fishing in consultation with the state and in accordance with the *Fishery Management Plan* 9. developing permit systems for various activities 10. regulating vessel type, size, and speed 11. managing recreational and commercial fishing Facilities in this zone would be small, unobtrusive, and dispersed. Facilities would provide basic visitor services, enhance visitor safety, and be compatible with resource protection goals. Facilities could include 1. primitive trails 2. signs, mooring buoys, and navigation markers 3. interpretive exhibits 4. restrooms, primitive camping, and picnicking sites 5. research equipment

TABLE 2. BISCAYNE NATIONAL PARK MANAGEMENT ZONES

	Resource Condition	Visitor Experience	Management Actions and Facilities
Slow Speed Zone (Minimum Wake) (All Alternatives)	The preservation of shallow water habitats, restoration of degraded and impacted resources, and continuation of natural processes would be resource goals in this zone. 1. Protection and continuation of natural processes. 2. Minor impact to panoramic viewsheds. 3. There would be tolerance for minor resource impacts, including noise levels. 4. Evidence of human impact would be minimal or part of a cultural scene. 5. The significance and vulnerability of cultural resources would be evaluated, and appropriate management actions would be determined.	Visitors would have opportunities to experience nature. 1. Appropriate visitor activities would include boating (motorized or nonmotorized), sightseeing, fishing (potentially with limitations on commercial fishing), swimming, snorkeling, scuba diving, and nature observation. 2. Boats with motors could be used when propelled at slow (minimum wake) speeds to reduce user conflicts and ensure visitor safety. 3. Visitor activities would be mostly self-directed and have minor resource impacts. 4. Limited commercial services might provide appropriate visitor recreational activities if compatible with resource protection goals and desired visitor experience.	Management actions would focus on protecting visitors and water-based resources, restoring disturbed areas, minimizing impacts from visitor use, and reducing conflicts among different types of users. Appropriate management actions could include 1. determining types of use (user capacity) considering the desired visitor experience and the vulnerability of resources to impacts 2. inventorying and monitoring resources 3. providing interpretation and enforcement services 4. conducting research and restoring and stabilizing resources 5. taking measures to prevent human-caused impacts 6. defining additional compatible uses Facilities generally would not be appropriate, except when determined they would enhance resource protection or public safety. Facilities could include 1. signs and other navigational aids 2. research and monitoring apparatus that is minimal and unobtrusive 3. mooring buoys and informational markers such as hazard markers

TABLE 2. BISCAYNE NATIONAL PARK MANAGEMENT ZONES

	Resource Condition	Visitor Experience	Management Actions and Facilities
Noncombustion Engine Use Zone (All Alternatives)	The preservation of natural sounds, near-shore nursery areas and shallow water habitats, restoration of degraded and impacted resources, and continuation of natural processes would be the dominant resource goals in this zone. 1. Natural processes would predominate. 2. Natural sounds, sights, and vistas would prevail. Panoramic viewsheds would remain unaltered. 3. There would be tolerance for minor resource impacts. 4. Evidence of human impact would be minimal or part of a cultural scene. 5. Human-caused intrusions, including visual obstructions, would be kept to an absolute minimum, except for resource protection and visitor safety purposes. 6. The significance and vulnerability of cultural resources would be evaluated, and appropriate management actions would be determined.	Visitors would be immersed in nature with opportunities to experience natural sounds, tranquility, and closeness to nature. 1. Appropriate visitor activities could include noncombustion engine boating (paddling, poling, or trolling), sightseeing, fishing (potentially with limitations on commercial fishing), swimming, snorkeling, scuba diving, and nature observation. 2. Boats equipped with combustion engines could be used when propelled by push-pole or electric trolling motor, with outboard engine tilted up. 3. Visitors would be self-reliant and have maximum opportunities to experience a sense of discovery and adventure. Application of outdoor skills would be essential. 4. The sights and sounds of nature would be more prevalent than those of human activities. Visitor activities would be mostly self-directed and have minor resource impacts. 5. There would be some opportunities for interpretive activities. 6. Special events would not be allowed. 7. Visitor activities in these zones could be limited in the interest of protecting resources and enhancing public safety. Limitations might be short or long term. 8. Use of combustion engines would generally not be allowed. However, in designated areas (between 3 feet to 5 feet in depth), the use of combustion engines would be allowed at slow speeds in channels. 9. Limited commercial services might provide appropriate visitor recreational activities if compatible with resource protection goals and desired visitor experience.	Management actions would focus on protecting water-based resources, restoring disturbed areas, minimizing impacts from visitor use, and providing visitors with educational opportunities that encourage resource protection. Appropriate management actions could include 1. inventorying and monitoring resources 2. determining types and levels of use considering the desired visitor experience and the vulnerability of the resources to impacts 3. providing interpretation and enforcement services 4. conducting research and restoring and stabilizing resources 5. taking measures to prevent human-caused impacts 6. defining additional compatible uses 7. developing a permit system for various activities 8. managing recreational and commercial fishing Facilities generally would not be appropriate, except when determined that they would enhance resource protection or public safety. Facilities could include 1. signs and other navigational aids 2. research equipment—if installed, research apparatus would be minimal and unobtrusive; if research could be accomplished in another management zone, it would not occur in this zone 3. mooring buoys

TABLE 2. BISCAYNE NATIONAL PARK MANAGEMENT ZONES

	Resource Condition	Visitor Experience	Management Actions and Facilities
Access-by-Permit Zone (Alternatives 3 and 5)	The access-by-permit zone would provide opportunities for visitors to recreate in natural or cultural settings where natural processes occur with minor evidence of disturbance from human use. The zone would provide protection for resources such as fish nursery areas and coral reefs. 1. Natural processes would predominate. This management zone would perpetuate a full complement of native species. 2. Natural sounds, sights, and vistas would prevail. 3. There would be tolerance for minor resource impacts. 4. Evidence of human impact would be minimal or part of a cultural scene. 5. Human-caused intrusions, including visual obstructions, would be kept to an absolute minimum, except for resource protection and visitor safety purposes. 6. The significance and vulnerability of cultural resources would be evaluated, and appropriate management actions would be determined.	Visitors would be immersed in nature. Visitor activities and access to these zones would be managed through a permit system to provide visitors with opportunities to experience natural sounds, tranquility, closeness to nature, and a sense of relative remoteness. Limited numbers of visitors would enjoy a full range of resource-based recreational opportunities. 1. Appropriate activities could include sightseeing, boating, swimming, snorkeling, scuba diving, and fishing. 2. Visitor activities would usually be self-directed, which would require self-reliance and provide maximum opportunities to experience a sense of discovery and adventure. Application of outdoor skills would be essential. 3. Visitors would receive orientation and information, interact with park staff and experience and learn about park resources before and after entering the park. Interpretive and educational opportunities would enable visitors to plan their trip into the park in advance through the permitting system. 4. Special events would not be allowed. 5. The probability of encountering others would be low. There would only be occasional encounters with others outside of one's social group. 6. Vessel type, size, and speed might be regulated to enhance resource protection and preserve the desired visitor experience. 7. Visitor activities could be structured through the use of commercial services with groups of limited size.	Management actions would focus on protecting resources, ensuring visitors have an uncrowded experience, minimizing impacts from visitor use, and providing visitors with educational opportunities that encourage resource protection. Appropriate management actions could include 1. determining types and levels of use considering the desired visitor experience and the vulnerability of resources to impacts 2. managing and limiting access through a permit system 3. providing interpretation and enforcement services 4. taking measures to prevent human-caused impacts 5. regulating visitor activities and vessel type, size, and speed 6. authorizing commercial services 7. conducting research and monitoring resource conditions; restoring and stabilizing resources 8. managing recreational and commercial fishing Facilities generally would not be appropriate, except when determined they would enhance resource protection or public safety. Facilities could include 1. signs and other navigational aids 2. limited mooring buoys 3. primitive trails 4. research equipment—If installed, research apparatus would be minimal and unobtrusive; if research could be accomplished in another management zone, it would not occur in the access-by-permit zone

TABLE 2. BISCAYNE NATIONAL PARK MANAGEMENT ZONES

	Resource Condition	Visitor Experience	Management Actions and Facilities
Nature Observation Zone (Alternatives 2, 3, 4, 5, 6, 7, and 8)	The preservation of natural and cultural resources, restoration of degraded and impacted resources, and continuation of natural processes would be the dominant goals in this zone. The nature observation zone would provide a sustainable ecosystem, including fully functioning communities, with natural complexity structure, and diversity of organisms. 1. Natural processes would predominate. Nature observation areas would preserve and/or restore a full complement of native species. 2. Natural sounds, sights, and vistas would prevail. Panoramic viewsheds would remain unaltered. 3. There would be tolerance for minor resource impacts. 4. Evidence of human impact would be minimal or part of a cultural scene. 5. Human-caused intrusions, including visual obstructions, would be kept to an absolute minimum, except for resource protection and visitor safety purposes. 6. The significance and vulnerability of cultural resources would be evaluated, and appropriate management actions would be determined.	Visitors would be immersed in nature with opportunities to experience natural sounds, tranquility, solitude, and closeness to nature. Visitors would have opportunities to experience and gain in-depth knowledge about sustainable ecosystems with fully functioning interdependent communities of organisms. 1. Appropriate visitor activities could include sightseeing, nature observation, and fishing. 2. Visitors would be self-reliant and have maximum opportunities to experience a sense of discovery and adventure. Application of outdoor skills would be essential. 3. Interaction with nature would predominate, with only occasional encounters with others. There would be a sense of relative remoteness. The sights and sounds of nature would be more prevalent than those of human activities. Visitor activities would be mostly self-directed and have minor resource impacts. 4. There would be opportunities for interpretive activities emphasizing sustainable ecosystems. 5. Special events would not be allowed. 6. Visitor activities in these zones could be limited in the interest of protecting resources and enhancing public safety. Limitations might be short or long term. 7. Limited commercial services that provide appropriate visitor recreational activities might be appropriate if compatible with resource protection goals and desired visitor experience.	Management actions would focus on protecting resources, restoring disturbed areas, minimizing impacts from visitor use, and providing visitors with opportunities that encourage understanding of the natural functioning of resources within a sustainable ecosystem. Appropriate management actions could include 1. determining types and levels of use considering the desired visitor experience and the vulnerability of resources to impacts 2. intense inventorying and monitoring of resources 3. providing interpretation and enforcement services 4. conducting research and restoring and stabilizing resources 5. taking measures to prevent human-caused impacts 6. defining additional compatible uses 7. developing permit systems for various activities Facilities generally would not be appropriate, except when determined that they would enhance resource protection or public safety. Facilities could include 1. signs and other navigational aids 2. primitive trails 3. research equipment—if installed, research apparatus would be minimal and unobtrusive; If research could be accomplished in another management zone, it would not occur in the nature observation zone

TABLE 2. BISCAYNE NATIONAL PARK MANAGEMENT ZONES

	Resource Condition	Visitor Experience	Management Actions and Facilities
Sensitive Resource Zone (Alternatives 2, 3, 4, 5, 6, 7, and 8)	**Natural Resources:** The sensitive resource zone would provide complete protection for exceptional and critical ecosystems, habitats, and processes and for sensitive nesting and nursery areas. Natural processes occur with negligible disturbance from human use. This zone would be closed to visitor access to permit natural processes to proceed. Research or actions aimed at monitoring natural conditions could occur. 1. Natural processes would predominate. 2. Natural land, sea, and soundscapes would predominate within the zone. 3. There would be no tolerance for resource impacts. 4. Lasting signs of human use would not be apparent. 5. Intervention and restoration could occur to mitigate and stabilize human-caused destruction. Otherwise, alterations to natural resources would not occur. 6. The significance and vulnerability of natural resources would be evaluated, and appropriate management actions would be determined. **Cultural Resources:** The sensitive resource zone would provide complete protection for exceptional and sensitive cultural sites and landscapes. This zone would be closed to visitor access to protect site integrity. Research activities could occur. 1. Natural land, sea, and soundscapes would be maintained as much as possible. 2. Cultural resource degradation would not be tolerated. Intervention of natural processes might occur to protect cultural site integrity. 3. Evidence of historic human use that contributes to the site's cultural value would be apparent. 4. Preservation and stabilization actions might occur.	**Natural Resources:** Sensitive resource zones would not be managed for visitor access, and use would be highly restricted. 1. Visitors would not be allowed into the zone. Research activities might be allowed under a permit. 2. Researchers and other cooperating personnel might enter the zone for authorized purposes. Any impacts on natural processes would not be tolerated. 3. Visitors would benefit by learning about sensitive and vulnerable resources as well as how they are studied and preserved. 4. Vessels and vehicles would be restricted from the zone except for administrative, emergency, or research purposes. 5. Commercial activity would not be allowed. **Cultural Resources:** This zone would not be managed for visitor access, and use would be highly restricted. 1. Visitors would not be allowed into the zone. Research activities might be allowed under a permit. 2. Researchers and other cooperating personnel could enter the zone for authorized purposes. Any impacts on cultural resources would not be tolerated. 3. Visitors would benefit by learning about sensitive and vulnerable resources as well as how they are studied and preserved. 4. Vessels and vehicles would be restricted from the zone except for administrative, emergency, or research purposes. 5. Commercial activity would not be allowed.	**Natural Resources:** Management actions would focus on the preservation and protection of ecosystems, habitats, and processes unique to this zone. Appropriate management actions could include 1. intervening and restoring resources to mitigate and stabilize human-caused destruction 2. conducting research aimed at monitoring resource conditions and understanding natural processes 3. prioritizing, overseeing, and managing research projects 4. taking measures to prevent human-caused impacts 5. defining additional compatible uses 6. providing interpretive and enforcement services Facilities would not be allowed. If installed, research apparatus would be minimal and unobtrusive. If research could be accomplished in another management zone, it would not occur in the sensitive resource zone. **Cultural Resources:** Management actions would focus on preservation and protection of cultural sites and landscapes. Appropriate management actions could include 1. mitigating, stabilizing, and restoring resources and collecting artifacts in imminent danger of destruction or loss 2. conducting research aimed at monitoring resource conditions and understanding the cultural context 3. prioritizing, overseeing, and managing research projects 4. taking measures to prevent human-caused impacts 5. defining additional compatible uses 6. providing interpretive and enforcement services Facilities would not be allowed in this zone. If installed, research apparatus would be minimal and unobtrusive. If research could be accomplished in another management zone, it would not occur in the sensitive resource zone.

TABLE 2. BISCAYNE NATIONAL PARK MANAGEMENT ZONES

	Resource Condition	Visitor Experience	Management Actions and Facilities
Sensitive Underwater Archeological Zone (All Alternatives)	The sensitive underwater archeological zone would provide protection for significant and vulnerable underwater cultural sites. Research activities could occur. 1. Natural sea and soundscapes would be maintained as much as possible. 2. Human-caused cultural resource degradation would not be tolerated. Intervening on natural processes would be allowed if necessary to protect cultural site integrity. 3. Preservation and stabilization actions might occur.	Visitors would view protected resources from within vessels on the surface of the water. Research activities might be allowed under permit. 1. Appropriate visitor activities could include sightseeing, nature watching, hook-and-line fishing, and transit through the zone. Apparatus other than hook-and-line fishing gear would not be allowed in the water below the lowest point of the vessel. Trapping would not be allowed. Anchoring and mooring would not be allowed. 2. Visitors must remain in their boats, and access to the water for activities including swimming, snorkeling, or scuba diving would not be allowed. 3. Researchers and other cooperating personnel could enter the zone for authorized purposes. Any impacts on cultural resources would be negligible. 4. Visitors would benefit from the research by learning about significant and vulnerable resources as well as how they are studied and preserved. 5. Commercial services would only transit through the zone. 6. Underwater viewing devices, including but not limited to, face masks, glass-bottom vessels, glass-bottom buckets, and/or underwater cameras of any kind would not be allowed.	Management actions would focus on preservation and protection of underwater cultural sites. Appropriate management actions could include 1. mitigating, stabilizing, and restoring resources and collecting artifacts in imminent danger of destruction or loss 2. conducting research aimed at monitoring resource conditions and understanding the cultural context 3. prioritizing, overseeing, and managing research projects 4. taking measures to prevent human-caused impacts 5. defining additional compatible uses 6. managing fishing 7. entering into agreements aimed at resource protection Facilities generally would not be appropriate, except when determined that they would enhance resource protection or public safety. Facilities could include 1. signs and other navigational aids 2. research equipment—If installed, research apparatus would be minimal and unobtrusive; if research could be accomplished in another management zone, it would not occur in the sensitive underwater archeological zone

TABLE 2. BISCAYNE NATIONAL PARK MANAGEMENT ZONES

	Resource Condition	Visitor Experience	Management Actions and Facilities
Special Recreation Zone (Alternatives 6 and 7)	The special recreation zone would provide some protection from direct human-caused impacts for water-based ecosystems, habitats, and processes while allowing visitors to experience the zone. Natural processes occur with minor disturbance from human use. This zone would provide a moderate-to-high level protection to natural resources such as marine nursery areas and coral reefs. The special recreation zone would provide the opportunity to compare the resource status of an area with limited extractive uses to other areas allowing removal of resources. 1. Natural processes would predominate. 2. Resource impacts would be reduced. 3. Some lasting signs of human use would be reduced. 4. Intervention and restoration could occur to mitigate and stabilize human-caused disruption or for resource management purposes. 5. The significance and vulnerability of cultural resources would be evaluated and appropriate management actions would be determined.	Visitors would be immersed in nature with opportunities to experience natural sounds, tranquility, and closeness to nature. Recreational fishing would be allowed with limitations; nonextractive activities would be allowed. Research activities would continue to be allowed under the NPS permit process or by the National Park Service, consistent with all park areas. 1. Appropriate visitor activities could include fishing (with limitations), boating, sightseeing, nature-watching, mooring, swimming, snorkeling, and scuba diving. Anchoring would not be allowed. 2. Visitors would be self-reliant and have maximum opportunities to experience a sense of discovery and adventure. Application of outdoor skills would be essential. 3. Interaction with nature would predominate, with a moderate level of encounters with others. The sights and sounds of nature would generally be more prevalent than those of human activities. Visitor activities would be mostly self-directed and have minor resource impacts. 4. Visitors would benefit from the research by learning about protected resources. 5. Limited commercial services that provide appropriate visitor recreational activities might be allowed if compatible with resource protection goals and desired visitor experience.	Management actions would focus on protecting resources, ensuring visitors have an uncrowded experience, minimizing impacts from visitor use, and providing visitors with educational opportunities that encourage resource protection. Appropriate management actions could include 1. determining types and levels of use considering the desired visitor experience and the vulnerability of resources to impacts 2. intervening and restoring natural resources to mitigate and stabilize human-caused disruption 3. conducting research aimed at monitoring resource conditions and understanding natural processes to implement adaptive management 4. prioritizing, overseeing, and managing research projects 5. taking measures to prevent human-caused impacts 6. defining additional compatible uses Facilities generally would not be appropriate, except when determined they would enhance resource protection or public safety. Facilities could include 1. signs, mooring buoys, and navigational aids 2. research equipment (if installed)—research apparatus would be minimal and unobtrusive

TABLE 2. BISCAYNE NATIONAL PARK MANAGEMENT ZONES

	Resource Condition	Visitor Experience	Management Actions and Facilities
Idle Speed Zone (No Wake) (Alternative 8)	The preservation of shallow water habitats, restoration of degraded and impacted resources, and continuation of natural processes that support healthy interaction among human, plant, and wildlife communities would be resource goals in this zone. 1. Protection and continuation of natural processes. 2. Minor impact to panoramic viewsheds. 3. There would be tolerance for minor resource impacts, including noise levels. 4. Evidence of human impact would be minimal or part of a cultural scene. 5. The significance and vulnerability of cultural resources would be evaluated, and appropriate management actions would be determined.	Visitors would have opportunities to experience nature. 1. Appropriate visitor activities would include boating (with propulsion by paddles, trolling motors, or poles), sightseeing, fishing, swimming, snorkeling, scuba diving, and nature observation. 2. Boats with motors could be used when propelled at idle (no wake) speeds to reduce user conflicts and ensure visitor safety. 3. Visitor activities would be mostly self-directed and have minor resource impacts. 4. Limited commercial services might provide appropriate visitor recreational activities if compatible with resource protection goals and desired visitor experience.	Management actions would focus on protecting visitors and water-based resources, restoring disturbed areas, minimizing impacts from visitor use, and reducing conflicts among different types of users. Appropriate management actions could include 1. determining types of use (user capacity) considering the desired visitor experience and the vulnerability of resources to impacts 2. inventorying and monitoring resources 3. providing interpretation and enforcement services 4. conducting research and restoring and stabilizing resources 5. taking measures to prevent human-caused impacts 6. defining additional compatible uses Facilities generally would not be appropriate, except when determined they would enhance resource protection or public safety. Facilities could include 1. signs and other navigational aids 2. research and monitoring apparatus that is minimal and unobtrusive 3. mooring buoys and informational markers such as hazard markers

FORMULATION OF THE ALTERNATIVES

The National Park Service prepares management alternatives to explore different approaches to managing the park. Each alternative must be within the bounds of laws, policies, and the park's purpose. They also present different ways to achieve the desired future conditions of the park.

The alternatives focus on *what* resource conditions and visitor uses and experiences/opportunities should happen at the park rather than on details of *how* these conditions and uses/experiences should be achieved. Thus, the alternatives do not include many details on resource or visitor use management.

More detailed plans or studies will be required before most conditions proposed in the alternatives are achieved. The implementation of any alternative also depends on future funding and environmental compliance. This plan does not guarantee that funding would be forthcoming. The plan establishes a vision of the future that will guide day-to-day and year-to-year management of the park, but full implementation could take many years.

ACTIONS COMMON TO ALL ALTERNATIVES

The following actions would be implemented regardless of which alternative is approved. The actions described here should be considered in addition to the actions described specifically for each alternative.

FOWEY ROCKS LIGHTHOUSE

In the 2011 Draft Plan released for public comment in 2011, acquisition of the historic (1878) Fowey Rocks Lighthouse by the National Park Service from the U.S. Coast Guard (USCG) via the General Services Administration was presented in alternative 5, but not in the preferred alternative 4. The National Park Service received public comments as well as comments from the Florida state historic preservation office supporting both NPS acquisition of the lighthouse as well as the proposal in alternative 4 to partner with the eventual owner of the light after its divesture by the U.S. Coast Guard through the National Historic Lighthouse Preservation Act. In the intervening time period, the National Park Service contracted the completion of a detailed condition assessment and obtained cost estimates for stabilization and rehabilitation needs of the lighthouse. The results of these reports led park managers to believe that the best strategy for ensuring the continued protection and public interpretation of the lighthouse (located within the boundary of Biscayne National Park) would be to accept the no-cost transfer of the structure from the U.S. Coast Guard. This transfer was completed in October 2012. The National Park Service will manage the lighthouse in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties* and has initial plans in place to complete repairs that will stabilize the structure, protect it from further deterioration, and potentially provide for visitor access in the future. It is currently closed to visitation due to safety concerns.

FISHING

Recreational and commercial fishing would continue in the park in accordance with the *Fishery Management Plan*, except in the marine reserve zone in alternatives 3, 4, 5, and 8, and with limitations, in the special recreation zone in alternatives 6 and 7. (Note: for alternatives 6 and 7, after the 10-year evaluation interval, the option to institute a marine reserve zone would be considered.)

All actions concerning fishing in the park would be implemented in accordance with the *Fishery Management Plan*. Implementing the *Fishery Management Plan* (2014) would be accomplished through state rulemaking by the FWC and federal special regulations promulgated in consultation with the commission. The new park-specific State of Florida fishing regulations have yet to be drafted, and the schedule for their approval and establishment is unknown at this time. The public will have the opportunity to comment on all proposed regulatory changes. For more information on the *Fishery Management Plan*, please visit http://www.nps.gov/bisc/parkmgmt/fishery-management-plan.htm.

Harvest of exotic invasive lionfish would continue to be managed in compliance with existing plans.

The National Park Service will consult with the FWC prior to developing and implementing management actions that modify current management of fishing within Biscayne National Park. Management actions include but are not limited to new or modified use of management strategies that limit the use

of internal combustion motors or limit vessel speed.

MOORING BUOYS

The use of mooring buoys and anchoring in the presence of mooring buoys would continue to be consistent with park policies and federal regulations.

STILTSVILLE

Stiltsville encompasses seven structures in the bay waters in the northernmost portion of the park that were privately built and maintained before being incorporated within the park's expanded boundary. These structures were used privately for several years under leases issued by the National Park Service. These leases have since expired. The Stiltsville structures have been determined as not eligible for listing in the National Register of Historic Places, although they might contribute to an ethnographic resource. For all alternatives, the management of the Stiltsville structures would continue as described in the June 2003 General Management Plan Amendment. Accordingly, a single, nonprofit organization under agreement with the National Park Service would continue to manage, use, and maintain the Stiltsville structures to provide broad public access and diversity of use consistent with NPS policy and best management practices for environmental protection. These uses might include public functions and services including nonprofit organization functions; public and private education programs; scientific research activities; artist-in-residence programs; professional meetings and retreats; day use; rustic retreats; and NPS functions including interpretation, resource management, and ranger activities. Funds for the maintenance and operation of the structures shall be derived from donated funds and grants, from participating entities, and from user fees.

RAGGED KEYS

The series of five small keys north of Boca Chita Key (and within the park boundary) is known as the Ragged Keys. Ragged Keys No. 2, No. 3, and No. 5 are currently privately owned and are thought to contain important natural and cultural resources. The National Park Service would continue to pursue acquisition of these keys from willing sellers.

BLACK POINT JETTY

Black Point Jetty, adjacent to Black Point Marina County Park, is owned by Biscayne National Park. A memorandum of agreement with the county outlines each party's responsibilities for facility maintenance. This approximately mile-long jetty would continue to offer visitor opportunities to walk, bicycle, fish, picnic, observe nature, and sightsee with broad vistas of the bay. The park would continue to explore the possibility of developing interpretive opportunities in this area.

DREDGED NAVIGATION CHANNELS

The management objective of these channels is for resource protection and safe travel within the park. All of the park's dredged channels (the Intracoastal Waterway, Black Point Marina Channel, Homestead Bayfront Marina Channel, and Turkey Point Channel) would continue to be periodically dredged to keep them open to boaters and shipping traffic. For example, portions of the Intracoastal Waterway would continue to be dredged by the U.S. Army Corps of Engineers, and the U.S. Coast Guard would continue to be responsible for marking the channel with navigational markers. Miami-Dade County would continue to mark and dredge both the Black Point and the Homestead Bayfront marina channels. The Florida Power & Light Company would continue to be responsible for the Turkey Point Channel.

No new dredged channels would be permitted anywhere in the park. Depth limits for dredging would continue to be enforced; that is, the dredging depths within the park would continue with the following "not to exceed" limits:

- Intracoastal Waterway, 7 to 12 feet per USCG regulations
- Black Point Marina Channel, 4.5 feet
- Homestead Bayfront Marina Channel, 4.5 feet
- Turkey Point Channel, 7.5 feet

NATURALLY OCCURRING CHANNELS

Certain naturally occurring channels in the park would continue to be marked for navigation. These include Biscayne Channel, Boca Chita Harbor Channel, Caesar Creek Channel, Hawk Channel, and Pacific Reef Channel.

The U.S. Coast Guard would continue to maintain the markers for Biscayne and Hawk channels. The National Park Service would continue to maintain those for Boca Chita Harbor and Caesar Creek channels. These channels are generally kept open by tidal action and would not be dredged. They would continue to function as important elements of the park's transportation and circulation system.

RESEARCH LEARNING CENTER

The 2001 NPS Parks for Learning Plan budget proposal called for the establishment of 32 learning centers, one serving each of the U.S. ecoregions, with base funding of $225,000 for each center. The Biscayne National Park proposal to host a research learning center was accepted by the review team. Funding was only received for 12 research learning centers. Although the Biscayne research learning center was not funded, should funding become available the park could consider initiating a research learning center. The mission of research learning centers is to increase the effectiveness and communication of research and science results in the national parks. Specific objectives include facilitating the use of parks for scientific inquiry, supporting science-informed decision making, communicating the relevance of and provide access to knowledge gained through scientific research to park staff and the public, and promoting science literacy and resource stewardship to the public.

CLOSURES

Area closures could be implemented through the Superintendent's Compendium or through special regulations published in 36 CFR for a variety of administrative reasons. Such reasons may be to protect human health and safety, for protection of sensitive natural and cultural resources, and for areas undergoing environmental restoration.

EXOTIC INVASIVE SPECIES

Exotic plants would be managed as described in the Exotic Plant Management Plan.

Exotic invasive lionfish would be managed as provided in the *Lionfish Response Plan: A Systematic Approach to Managing Impacts from the Lionfish, an Invasive Species, in Units of the National Park System* (McCreedy et al. 2012) and Biscayne National Park's Lionfish Management Plan (McDonough 2008).

VESSEL GROUNDINGS

Vessel groundings would be managed as described in the park's "Vessel Groundings Policy and Procedures."

PARTNERSHIPS

The park hosts approximately a half million visitors annually, including many visitors from

outside the local area who visit the national park to learn about and experience the park's natural and cultural resources.

Additional partnership agreements would be sought to expand the park's capacity both inside and beyond park boundaries at sites such as marinas and state and county parks in an effort to engage these potential visitors. Partnerships with Homestead Bayfront County Park, Black Point County Park, Mattheson Hammock County Park, and Bill Baggs Cape Florida State Park would allow new or improved kiosks, signs, and interpretive programs. Other potential sites to explore could include Dinner Key (in Coconut Grove), No Name Harbor (in Bill Baggs Cape Florida State Park), Crandon Park (on Key Biscayne), Deering Estate (Palmetto Bay), and Palmetto Bay Village Center. Some sites could include education programs and NPS personnel. Establishing a dock for paddlecraft access and storage on Old Cutler Road, north of the park boundary, would be pursued.

The National Park Service and the FWC would continue to collaborate on implementation of the *Fishery Management Plan*, which includes fishing and boating regulations in all park waters. For more information on the *Fishery Management Plan*, please visit http://www.nps.gov/bisc /parkmgmt/fishery-management-plan.htm.

The National Park Service would continue to collaborate with other entities to address water quality and many other concerns. These partnerships could include federal, state, and local agencies; community groups; commercial organizations; and individuals.

ALTERNATIVE 1: NO ACTION

CONCEPT

Under alternative 1, the no-action alternative, future management would be a general continuation of what is being done now to provide visitor opportunities and to protect and preserve park resources. Current law, policy, and plans, such as the 1983 General Management Plan and 2003 General Management Plan Amendment, would continue to provide the framework of guidance. This alternative would continue to emphasize a high level of access with recreational opportunities throughout the park. Natural resources, activities for restoration, and recovery or maintenance of habitats and dependent species would continue to be actively managed. Cultural resources maintenance and monitoring would continue. The park would continue to seek partnership opportunities to provide visitor services and resource management beyond current park boundaries. For example, park employees could staff visitor contact stations and monitor water quality parameters beyond park boundaries. This alternative serves as a basis of comparison between the park's existing management and the action alternatives 2 through 8.

Funded projects that would be conducted under this alternative include an upgrade of the radio system, erosion control, building and grounds maintenance, landscape enhancement, maintenance mentoring program, completion of Hurricane Sandy repair projects, and collection recovery.

THE MAINLAND

Convoy Point would continue to be the primary land-based entry point to the park. Visitors would park here and access the various available visitor services. The Dante Fascell Visitor Center would continue to provide orientation and interpretive information, including exhibits, videos, and sales of interpretive/educational materials. Park interpretive staff would continue to provide a variety of special talks and programs at Convoy Point. Visitors would have access to designated paths, the interpretive boardwalk, and jetty as part of the landscaped grounds surrounding the visitor center and park administration buildings. They could continue to picnic, bird-watch, and sightsee, with expansive views of the bay from the second-floor veranda of the visitor center. Pole fishing, cast-netting, and yo-yo fishing would continue to be allowed from the walkway/jetty area, but would continue to be prohibited in the boat basin.

From Convoy Point, the park is pursuing a commercial operator to provide the following authorized visitor services through a concessions contract:

- a small retail store where visitors can buy sandwiches, soft drinks, practical/convenience vacation items, and souvenirs
- rentals of paddlecraft; snorkeling and scuba diving equipment; snorkeling and scuba diving trips to the park's coral reefs and submerged cultural resources; boat tours to view the coral reefs without getting in the water; and a transport service to and from the mainland and Elliott or Boca Chita Keys for visitors who want to attend a ranger-led walk, hike independently, or camp

The park's narrow mainland areas north and south of Convoy Point are composed primarily of mangrove forest. For the most part, these areas receive very little visitation and would continue to be managed as remote

natural areas primarily to protect fish nurseries and crocodile habitat.

BAY AND OCEAN WATERS

Under this alternative, the park would continue to be open to visitors with private boats of varying sizes and sources of power, including motorboats and sailboats. Visitors could continue to choose from a variety of activities including shallow and deep-water boating, snorkeling, scuba diving, fishing, touring via commercial visitor services boats, visiting the keys, camping, paddling, sailing, windsurfing, and participating in boating events. The bay, the keys, and the coral reefs would continue to provide different settings to recreate in a marine atmosphere. Visitors could continue to seek solitude, if desired, and appreciate the many natural sights and sounds of nature—both above and below the water.

Fishing would continue in accordance with the enabling legislation of the park and as regulated by the state.

Popular snorkeling, scuba diving, and anchoring sites would be evaluated for the installation of mooring buoys. This would provide targeted resource protection and serve to disperse use at these locations and limit the number of boats. For more information on mooring buoys, refer to the "Common to All Alternatives" section.

Legare Anchorage

The purpose of the triangular-shaped Legare Anchorage (3 square miles in size) would continue to be the long-term protection of submerged cultural resources, particularly the HMS *Fowey* shipwreck, owned by the government of the United Kingdom of Great Britain and Northern Ireland. Visitors would not have underwater access; boaters could continue to traverse the area on the water's surface, or troll, but they could not stop, anchor, swim, or dive.

Slow Speed Areas

The bay includes many shallow water areas, and less experienced boaters often run into difficulties that result in groundings and/or propeller damage to park resources. These areas include the Safety Valve Shoals, the West, Middle, and East Featherbed Banks, the shallows around the southern keys, the manatee habitat adjacent to the coast, and congested visitor use areas in and near Sands Cut. The park has regulations to manage boating activity in some of these areas to protect resources and ensure visitor safety.

The management objective of the slow speed zone is to enhance visitor safety and resource protection by slowing vessel speeds in shallow water areas. Less experienced boaters often run into difficulties that result in groundings and/or propeller damage to these shallow water areas. There would continue to be three slow speed zones in the park. The first area would be the manatee protection area that parallels the mainland, out to 1,000 feet from shore from Black Point County Park south to Turkey Point. The second area would continue to be south of Sands Key along the northwest shore of Elliott Key to Coon Point. The noncombustion engine use area in Jones Lagoon would also continue. In this noncombustion engine use zone, boats equipped with combustion engines could be used when propelled by push-pole or electric trolling motor with the outboard motor tilted up.

THE KEYS

Boca Chita Key

Boca Chita Key would continue to be a park destination point for people who like boating as well as getting out and strolling in a historic designed landscape. Visitors could continue to dock in the harbor for day use activities and walk among the historic stone structures (such as the covered picnic pavilion and chapel) and tour the ornamental lighthouse. Restrooms, a picnic area, walking trail, primitive

campground for individual and group camping, overnight docking, and boat camping would also continue to be available. Kiosks for interpretation/education would remain at the harbor. The historic barn and chapel, currently used for storage, would also remain. The park would explore options to adaptively reuse these structures for park operations and visitor services. User fees would continue to be collected on Boca Chita Key, as would the existing procedure that allows the private use of some visitor facilities via a park-issued special use permit.

Elliott Key

Elliott Key would continue to be open to visitors to dock (both day use and overnight docking / boat camping), picnic, hike, camp, access restrooms, and obtain potable water. Interpretive programs, facilitated by a future concession operation, would continue. Several trails would remain for visitor activities—the unhardened central hiking trail referred to as "Spite Highway," the east-west breezeway trail, and the self-guided interpretive loop boardwalk trail. The visitor contact/ranger station would continue to be opened occasionally to provide park law enforcement, visitor safety services, some environmental education activities, administrative operations, and interpretive visitor services.

A formal ranger-led environmental education program would continue to be offered at Elliott Key.

Day-use docking would continue to be allowed at University Dock and existing ranger residences would remain.

Adams Key

Facilities at Adams Key would continue to include a day use dock, a picnic pavilion, restrooms, a walking trail, interpretive wayside exhibits, maintenance facility, and ranger residences. Adams Key would continue to remain an alternate (back-up) site for the formal ranger-led environmental education program.

Porgy, Totten, Old Rhodes, Reid, Rubicon, Swan, Long Arsenicker, and East Arsenicker

These keys would remain relatively remote places that seldom have visitors and could be closed should circumstances warrant, as described in the "Common to All Alternatives" section. The historic structures on Porgy Key would remain stabilized. Visitors would not be encouraged to visit the Jones homesite site on Porgy Key. Interpretive information about these keys would continue to be provided off-site at visitor areas like Convoy Point.

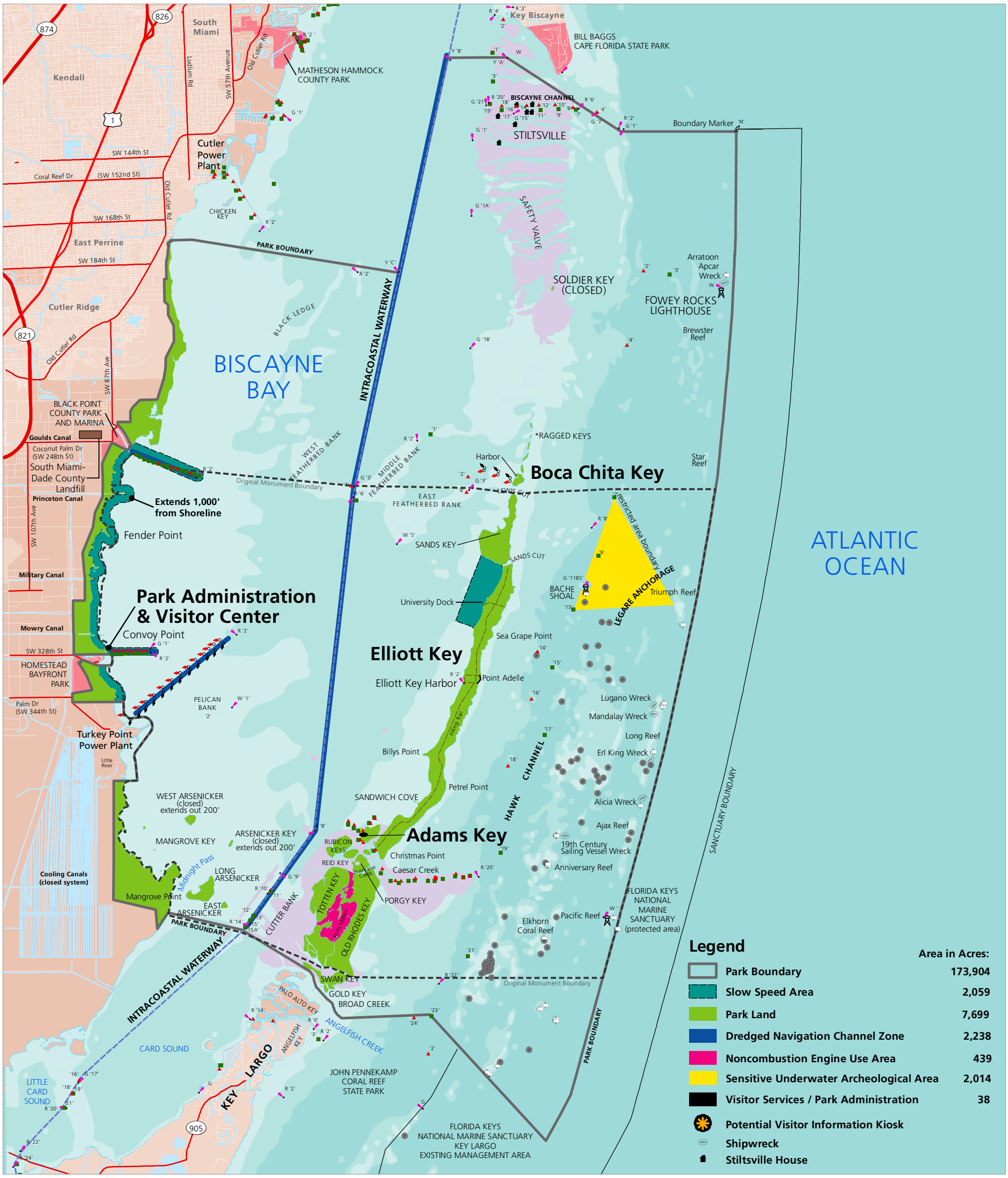
Arsenicker Key, West Arsenicker Key

These areas and the waters extending 200 feet from their shores would continue to be closed to visitors for natural resource protection. In particular, these keys provide important habitat for nesting birds.

Soldier Key would remain closed for the protection of sensitive natural or cultural resources.

Jones Lagoon

The lagoon would continue to be managed as a noncombustion engine use area to protect resources and provide a variety of visitor experience opportunities.



N W E S

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Map not for navigation

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Note: To show visually, the size of zone colors have been enlarged in certain areas.

Map Key to Water Features and Landmarks

Water Depths: 0-6 feet (0-1.8 meters); 6-12 feet (1.8-3.6 meters); Over 12 feet (Over 3.6 meters)

Shallows and Reefs: Shoal or spoil area; Coral reef near water surface; Coral reefs also lie deeper below water surface.

Aids to Navigation (entering from seaward): Red — Port side lateral marks (even numbered); Green — Starboard side lateral marks (odd numbered); Other buoy; Daymarker

Other Aids and Landmarks: Light; Danger Shoal; Tower; Mooring buoy

Light color: R Red, G Green, W White, Y Yellow

*RAGGED KEYS #2, #3, and #5 are Private Properties

Alternative 1

Biscayne National Park

United States Department of the Interior - National Park Service

DSC / October 2013 - Modified April 2015 / 169 - 20054

ALTERNATIVE 2

CONCEPT

Alternative 2 would emphasize the recreational use of the park while providing for resource protection as governed by law, policy, and resource sensitivity. This concept would be accomplished by providing the highest level of services, facilities, and access to specific areas of the park of all the action alternatives. Visitors would be able to access the entire park except small areas set aside for the protection of sensitive resources. Substantial concession services would enable visitors without their own boats to access the keys and bay and ocean waters. Additional staffing and a substantial built environment might be required to implement this alternative, and some areas might be developed beyond the current level. A high level of interaction among visitors, park staff, and park resources would be expected while providing a minimum level of resource protection.

The discussion of actions common to all alternatives, such as Stiltsville, Ragged Keys, and Black Point Jetty, are a part of this alternative.

THE MAINLAND

Convoy Point would remain the park's primary administrative and visitor service area on the mainland, as described in alternative 1. If additional administrative space were needed, selective administrative functions, currently accommodated at this location, might be moved to the local community; other functions would be expanded on-site.

Several new visitor facilities would be added to Convoy Point. A boardwalk and viewing platform would be built near Convoy Point to interpret the dwarf mangrove and marsh ecosystems. Site-specific environmental planning would be conducted before construction. The visitor center jetty and boardwalk would be improved for safety and enhanced visitor access. These improvements would consist of benches and shade structures. Site-specific environmental compliance would be conducted before construction.

Undeveloped portions of the mainland between Convoy Point and Black Point County Park would be managed according to the multiuse zone (land). The remainder of the mainland would be in the nature observation zone.

Miami Area Visitor Center

The park has long identified a need for a visitor contact station in northern Biscayne Bay to facilitate resource protection and education to park users. Possible locations of a satellite visitor education center include Coconut Grove and Virginia Key, both popular tourist destinations that are convenient to Miami residents. These properties are owned by the City of Miami and Miami-Dade County, respectively, and are less than 5 miles from the park boundary.

The park has been approached by these and other government agencies, including NOAA Fisheries, to partner with the National Park Service to open a visitor education center in one of these areas. This could include enhanced educational programming, expanded concession operations, sales outlets, and visitor contact opportunities. This action is still in the discussion stages. It is unknown what, if any, the National Park Service would be asked to contribute to construction or operational costs. At a minimum, the park may be able to provide some staffing and pay rent for the use of an

existing facility. Any facility rental or construction would require site-specific environmental planning. As in all cases of proposed construction, the National Park Service (or other responsible agency) would prepare site-specific NEPA and other environmental compliance documents.

The general concept to provide a visitor center in the Miami area is desirable and thus is an included concept in this alternative. However, actual implementation is being delayed because the current NPS capital investment strategy does not support new construction or significant capital outlays at this time. If or when such expenditures are possible at a future time, the concept of a visitor center in the Miami area will be pursued through partnership arrangements.

BAY AND OCEAN WATERS

Visitors could engage in various recreational activities such as sightseeing, boating, fishing, scuba diving, snorkeling, swimming, hiking, picnicking, camping, and visiting shipwrecks. The overall objective in this zone would be to provide visitors with opportunities to recreate and learn about park resources and to minimize resource impacts from visitor use. The multiuse zone (water) would be applied to most of the park's water acreage (see alternative 2 map).

Popular snorkeling, scuba diving, and anchoring sites would be evaluated for the installation of mooring buoys, consistent with the Mooring Buoy and Marker Plan. This would provide targeted resource protection and would disperse use at these locations.

There would be four slow speed zones in alternative 2. The first would parallel the mainland, between 500 and 1,000 feet out from shore from the park's northern boundary south to Midnight Pass. The second area would be due south of Sands Key along the northwest shore of Elliott Key. The third area would be in the bay west of Boca Chita Key and would include West, Middle, and East Featherbed Banks. The fourth area would be along Caesar Creek, south of Adams Key to Porgy Key, including the navigational channel between markers 20 to 24.

Under alternative 2, two shallow-water areas of the park would be included in the noncombustion engine use zone. The first area would follow the entire mainland shoreline from the northern park boundary south to Midnight Pass and extend east 500 feet from the mainland and exclude Black Point, Convoy Point, and Turkey Point Channels. The second area would be east of the Intracoastal Waterway and north of Broad Creek and would include Jones Lagoon, the waters around Totten Key, and the bayside of Old Rhodes Key, as shown on the alternative 2 map. The primary management objectives for this zone would be to immerse visitors in nature, minimize unnatural sounds, and protect shallow-water habitats and associated wildlife such as bonefish that use this area. Boats with combustion engines could enter the areas, but use of the engines would be prohibited; combustion engines would have to be tilted up in these zones. Motorized boaters would be required to use other means to propel their boats such as electric trolling motors, oars, paddles, poles, or sails.

Legare Anchorage

Legare Anchorage would be reduced to about 1 square mile and included in the sensitive underwater archeological zone, primarily to continue protecting underwater cultural resources. To facilitate protection and make it easier for boaters to identify, the area would be delineated by latitude and longitude lines and marked by dayboards or signs. Travel through the area in a vessel would be allowed, but drifting, mooring, anchoring, and entering the water would not. The use of underwater viewing devices would not be allowed. Recreational hook-and-line fishing would be allowed while trolling. Commercial fishing and trapping would not

be allowed. This area could be used for permitted research activities.

THE KEYS

Boca Chita Key

All of Boca Chita Key would be in the visitor services / park administration zone. The management and visitor use of the existing facilities would remain as described in alternative 1.

In addition, three historic structures on the key would be reused for park operations and visitor services. Two structures would be used for park operations and visitor services. The number of kiosks providing interpretive information would be increased. More tours would be conducted, and there would be additional seasonal on-site interpretive opportunities.

The retaining wall on the north side of the island would be strengthened to maintain its current size, shape, and location.

The procedure allowing the private use of some visitor facilities via a park-issued special use permit would continue.

Elliott Key

Elliott Key would continue to be open to visitors to dock (both day use and overnight docking/boat camping), picnic, hike, camp, access restrooms, and obtain potable water. User fees would continue to be collected.

Elliott Key Harbor, including all existing visitor service and park administration facilities, would be included in the visitor services / park administration zone. The specific uses of these facilities would generally remain as described in alternative 1 but could change to improve efficiency.

In addition, the current hiking trail, which goes north from the harbor area to Sweeting Homestead and south to Sandwich Cove (known as Spite Highway), would be made universally accessible and would be maintained as necessary for visitors with mobility challenges. The Breezeway Loop Trail would also be made accessible. Primitive trails would be developed to connect the central trail to University Dock and to Sandwich Cove, Petrel Point, and Sweeting Homestead. Also, primitive campsites would be established at the Petrel Point area, University Dock area, and Sandwich Cove. Site-specific environmental planning including archeological surveying would be conducted before establishing these trails and/or campsites. Toilets would be added at the new campsites and at University Dock, which would remain day use only. Visitor kiosks would be installed at the University Dock harbor. A paddlecraft launch area would be established. The establishment of a food concession, either in a structure on the island or on a vessel, would be explored.

To reduce visitor use conflicts, the environmental education program, currently offered at Elliott Key, would be moved to Adams Key. The present environmental education structure on Elliott Key would be adapted to provide general visitor services and include ranger offices, a visitor contact facility and exhibit area, interpretive/ educational material sales, and interpretive and orientation program areas. Existing ranger residences would remain.

Adams Key

All of Adams Key would be included in the visitor services / park administration zone. Existing facilities and uses would continue as described in alternative 1, but with improved visitor services. A staging area for paddlecraft might be developed, allowing visitors to be shuttled to Adams Key as a departure point to explore areas such as Jones Lagoon. The park would consider authorizing a commercial operator to provide paddlecraft services. The storage of paddlecraft would easily be

accommodated in the disturbed area of the island. Other potential visitor facilities might include primitive campsites, an improved trail for environmental education, and improvements to the dock. Instituting a slow speed zone would be considered and establishing a small commercial visitor services facility for sales of sundries and other convenience items would be explored.

To reduce visitor use conflicts on Elliott Key, the ranger-led environmental education program would be moved to Adams Key. To accommodate these programs, several facilities would need to be built or rehabilitated, including but not limited to improving the pavilion, establishing a group camping area, improving the existing trail, and adding indoor showers to the restrooms. Visitor use of these amenities would be restricted during the environmental education season, generally November through March. Building an additional classroom facility would be considered. The appropriate environmental planning would occur before building or rehabilitating any facilities or any other development necessary for moving this program.

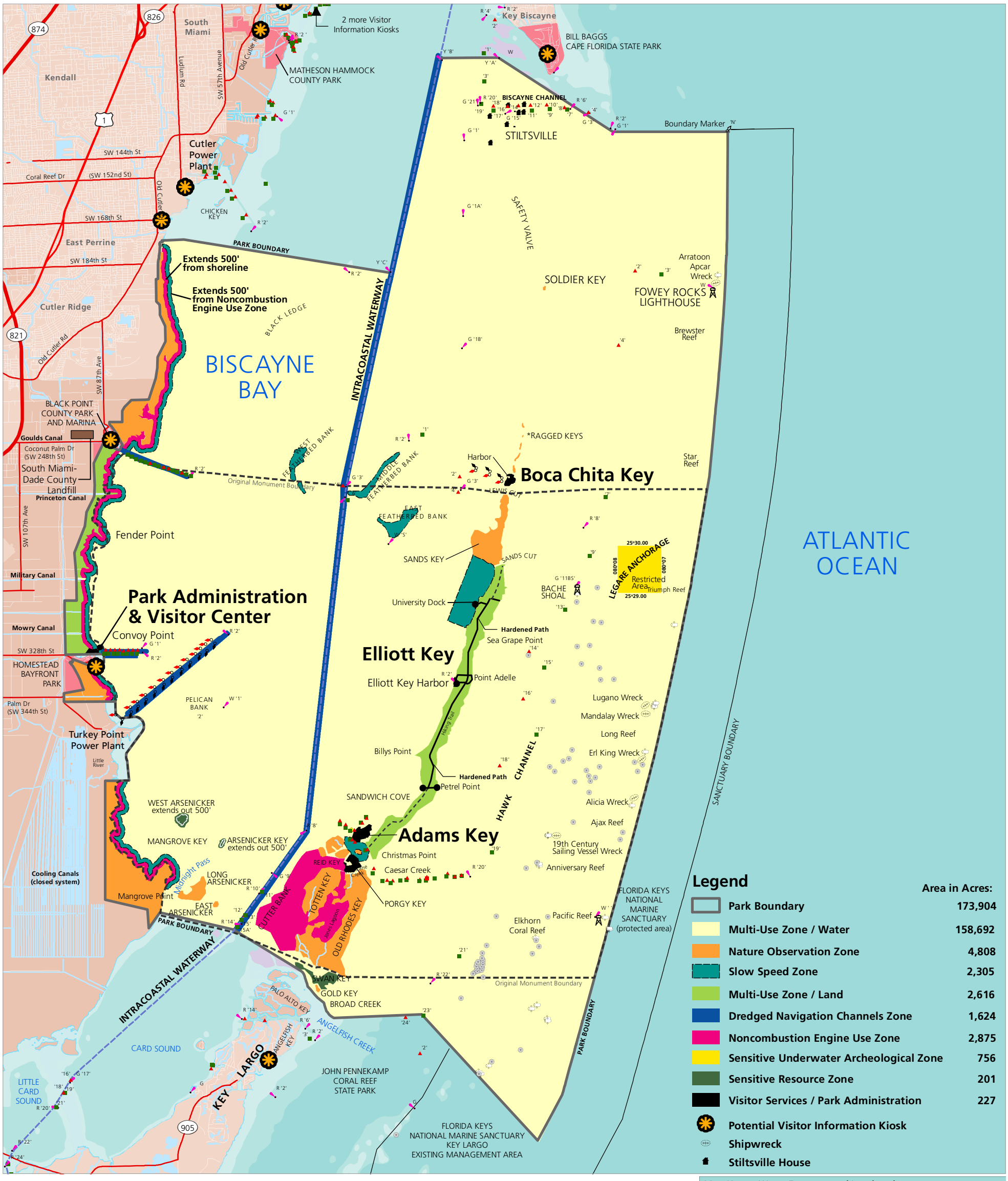
Porgy Key

All of this island would be in the visitor services / park administration zone. The historic Jones homesite on Porgy Key would be further stabilized and maintained and provide visitors an opportunity to see the historic uses of the keys before the creation of the park. Interpretive media would be used to tell the story of the site and life on the keys. A paddlecraft dock would be built to facilitate boat access to the site.

Other Keys

Several keys would be included in the nature observation zone—Soldier Key, Ragged Keys, Sands Key, Rubicon Keys, Reid Key, Old Rhodes Key, Totten Key, Gold Key, East Arsenicker Key, Long Arsenicker Key, Mangrove Key, and several smaller unnamed keys around Jones Lagoon.

West Arsenicker Key, Arsenicker Key, the water extending out 500 feet from these keys, and Swan Key would be included in the sensitive resource zone (and marked by dayboards or buoys) to protect exceptional and sensitive natural or cultural resources. Visitors would not be allowed in these areas, but research could occur under a science permit issued by the park.



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Map not for navigation

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Note 1: Existing conditions and some features such as the locations of shoals, reefs, and shallow coral areas, may be considered unchanged.

Note 2: To show visually, the size of zone colors have been enlarged in certain areas.

Note 3: Some areas in the Park Boundary are not NPS owned but do not appear at this map scale. Zoning shown would not apply to non NPS lands unless they were acquired from a willing seller.

Map Key to Water Features and Landmarks

Water Depths: 0-6 feet (0-1.8 meters); 6-12 feet (1.8-3.6 meters); Over 12 feet (Over 3.6 meters)

Shallows and Reefs: Shoal or spoil area; Coral reef near water surface; Coral reefs also lie deeper below water surface.

Aids to Navigation (entering from seaward): Red — Port side lateral marks (even numbered); Green — Starboard side lateral marks (odd numbered); Other buoy; Daymarker

Other Aids and Landmarks: Light; Danger Shoal; Tower; Mooring buoy

Light color: R Red, G Green, W White, Y Yellow

*RAGGED KEYS #2, #3, and #5 are Private Properties

Alternative 2

Biscayne National Park

United States Department of the Interior - National Park Service

DSC / October 2013 - Modified April 2015 / 169 - 20054

ALTERNATIVE 3

CONCEPT

Alternative 3 would allow all visitors a full range of experience opportunities throughout most of the park and use a permit system to provide opportunity for visitors to experience a sense of solitude in two distinct areas of the bay. Small areas would be set aside that prohibit visitor access to protect sensitive resources and allow wildlife a respite from human contact. Management actions would provide strong natural and cultural resource protection and diverse visitor experiences.

Additional staffing and some additional development might be required to implement this alternative.

Visitor opportunities in this alternative would range from the challenges of exploring the natural environment alone to the conveniences of built surroundings. A high level of interaction among visitors, park staff, and park resources would be expected. Orientation to the park would help visitors choose types and locations of activities and learn about resource preservation and stewardship. Some impacts on resources might be tolerated in high-use areas of the park. Biscayne National Park staff would coordinate with Florida Keys National Marine Sanctuary staff to ensure compatible management strategies in adjacent federal waters.

This alternative includes a marine reserve zone where fishing is prohibited. The purpose of the marine reserve zone is to provide visitors with the opportunity to experience a healthy, natural coral reef, with larger and more numerous tropical reef fish and an ecologically intact reef system. Recreational fishing opportunities would continue to be available in the majority of park waters including the approximately 70% of park coral reef areas (63% of park hardbottom habitats)that would be outside of the marine reserve zone.

Taking action in this alternative to protect reefs from other pressures such as overfishing; land-based sources of pollution; and physical damage from fishing gear, anchoring, and vessel groundings might increase reef resiliency, potentially delaying the effects of climate change stressors.

The discussion of actions common to all alternatives, such as Stiltsville, the Miami visitor center, Ragged Keys, and Black Point Jetty, are a part of this alternative.

THE MAINLAND

Convoy Point would remain the primary administrative and visitor service area of the park on the mainland, as described in alternative 1. If additional administrative space were needed, selected administrative functions currently at this location might be moved to the local community, while other functions would be expanded on-site.

Several new visitor facilities would be added to Convoy Point. A boardwalk and viewing platform would be built near Convoy Point to interpret the dwarf mangrove and marsh ecosystems. Site-specific environmental planning would be conducted before constructing the boardwalk.

The visitor center boardwalk would be improved to enhance visitor safety and access. These improvements would consist of benches and shade structures.

The mainland area between Convoy Point and Black Point County Park would be multiuse zone (land) and the remainder would be nature observation zone.

Miami Area Visitor Center

The park has long identified a need for increased visitor contact in northern Biscayne Bay to facilitate resource protection and education to park users. Possible locations of a satellite visitor education center include Coconut Grove and Virginia Key, both popular tourist destinations that are convenient to Miami residents. These properties are owned by the City of Miami and Miami-Dade County, respectively, and are less than 5 miles from the park boundary.

The park has been approached by these and other government agencies, including NOAA Fisheries, to partner with the National Park Service to open a visitor education center in one of these areas. This could include enhanced educational programming, expanded concession operations, sales outlets, and visitor contact opportunities. This action is still in the discussion stages. It is unknown what, if any, the National Park Service would be asked to contribute to construction or operational costs. At a minimum, the park may be able to provide some staffing and pay rent for the use of an existing facility. Any facility rental or construction would require site-specific environmental planning. As in all cases of proposed construction, the National Park Service (or other responsible agency) would prepare site-specific NEPA and other environmental compliance documents.

The general concept to provide a visitor center in the Miami area is desirable and thus is an included concept in this alternative. Actual implementation is being delayed because the current NPS capital investment strategy does not support new construction or significant capital outlays at this time. If or when such expenditures are possible at a future time, the concept of a visitor center in the Miami area will be pursued through partnership arrangements.

BAY AND OCEAN WATERS

The multiuse zone (water) would be applied to most of the park's water acreage (see alternative 3 map). Visitors could engage in various recreational activities such as sightseeing, boating, paddling, windsurfing, fishing, scuba diving, snorkeling, swimming, hiking, picnicking, camping, and visiting shipwrecks.

Popular snorkeling, scuba diving, and anchoring sites would be evaluated for the installation of mooring buoys. This would provide targeted resource protection and serve to disperse use at these locations. This would also limit the number of boats in these specific locations.

There would be four slow speed zones in alternative 3. The first would parallel the mainland, between 500 and 1,000 feet from shore, identical to alternative 2. The second area would be due south of Sands Key along the northwest shore of Elliott Key, identical to alternative 2. The third area would be in Biscayne Bay due west of Boca Chita Key and include the West, Middle, and East Featherbed Banks, a larger area than described in alternative 2. These areas would be delineated by existing and new markers. The fourth area would be along Caesar Creek south of Adams Key to Porgy Key, including the navigational channel between markers 20 to 24, identical to alternative 2. The size and shape of this latter area would be delineated by existing and new markers.

The noncombustion engine use zone would be applied along the mainland shore out to 500 feet, excluding the channels as described in alternative 2, and the waters from the Rubicon Keys and south to Cutter Bank Shallows would also be included. Boats equipped with combustion engines could be used when propelled by push-pole or electric trolling motor, with outboard engine tilted up.

The access-by-permit zone would provide visitors with relative solitude by using a permit system to limit the number of people who

could be in a specified area at one time. The two areas of the park included in this zone currently receive limited visitation and would provide places of low-density use as the population of South Florida increases. The first of these areas would include an area of the bay north of Black Point Channel, including Black Ledge. The second area would encompass the bayside waters along the southern shore of Elliott Key including Sandwich Cove north to Billy's Point.

Legare Anchorage

Legare Anchorage would be reduced to about 1 square mile and included in the sensitive underwater archeological zone, primarily to continue protecting underwater cultural resources. To facilitate protection and make it easier for boaters to identify, the area would be delineated by latitude and longitude lines and marked by dayboards or buoys. Travel through the area in a vessel would be allowed, but drifting, mooring, anchoring, and entering the water would not. Recreational hook-and-line fishing would be allowed while trolling. Commercial fishing and trapping would not be allowed. This area could be used for permitted research activities.

Marine Reserve Zone

The management objective for the marine reserve zone would provide swimmers, snorkelers, scuba divers, and those who ride a glass-bottom boat the opportunity to experience a healthy, natural coral reef with larger and more numerous tropical reef fish and an ecologically intact reef system.

A marine reserve is a no-fishing area that functions as a long-term management approach, which improves the size and quantity of fish and provides habitat and ecosystem protection and preservation (Bohnsack 1994; Bohnsack and Ault 1996; Halpern 2003).

Scientific data indicate that no-fishing zones are more effective at reducing mortality—especially for reef species—than other methodologies, including catch and release, slot limits, etc. For example, the National Park Service, State of Florida, and other entities engaged in a scientific evaluation of the Dry Tortugas National Park Research Natural Area, a no-take reserve. In 2012, they found that the size of red grouper, mutton snapper, yellowtail snapper, and hogfish had increased since implementation of the research natural area. In contrast, abundance and size of these species either remained the same or decreased in nearby areas of the Tortugas Region that are open to fishing. Abundance of adult spawning-sized fish also increased within the research natural area, relative to other areas, contributing to reproduction and vitality of regional reef fish populations in South Florida (South Florida Natural Research Center et al. 2012). A recent study found similar increases in size and abundance in marine reserves in the Tortugas Region, including the research natural area, which indicates the merits of marine reserves for the exploited species of red grouper, black grouper, mutton snapper, yellowtail snapper, and hogfish. An added benefit of the reserves in this region was the spillover effect in which areas surrounding the reserves exhibited larger fish populations, both in size and density (Ault et al. 2013).

Experience with marine reserves in Florida and elsewhere indicate that a well-designed marine reserve zone is a scientifically valid approach to restoring fish populations and would likely enable visitors to experience larger and more numerous fish at Biscayne National Park.

The park's reefs face a number of serious threats that the National Park Service has no authority to either regulate or manage, including ocean acidification and other effects of climate change, physical damage from derelict fishing gear, and pollution. The National Park Service anticipates that establishing a marine reserve zone would give park reefs the greatest opportunity for

ecosystem recovery in order to be resilient to these external threats (Jackson 2014).

The marine reserve zone would provide important research opportunities to monitor the difference in reef ecosystem health and visitor experience compared to areas where fishing occurs (see appendix E for more information on the marine reserve zone).

The marine reserve zone would allow visitors the opportunity to participate in reef activities such as boating, snorkeling, scuba diving, underwater photography, and nature viewing. Boats would have easy access via Caesar Creek and Hawk Channel. Anchoring would be allowed to continue in this zone until mooring buoys are phased in. Recreational and commercial fishing would be prohibited in this zone to encourage long-term protection of the reef ecosystem. Opportunities for spearfishing lionfish or other exotic invasive species identified by the park would continue in this zone consistent with the *Fishery Management Plan*. For more information on the *Fishery Management Plan*, please visit http://www.nps.gov/bisc/parkmgmt/fishery-management-plan.htm.

In 2009, the park held three public workshops to share possible criteria for determining the size, shape, and location for a marine reserve zone and asked the public to draw possible zones on park maps. These public-proposed maps were then analyzed by marine scientists from universities, NOAA Fisheries, and the National Park Service and ranked in order of effectiveness of reaching zone goals. The National Park Service then used an interdisciplinary team to propose the final zone size, shape, and location based on the scientists' rankings of the public-proposed zones. See appendix E for more details on the criteria and process.

This zone is the same size, shape, and location as presented in alternative 4. The marine reserve zone would be between Hawk Channel and the park's eastern boundary, extending from Pacific Reef north to Long Reef (10,502 acres). The proposed marine reserve zone would be about 6% of the waters of the park, and about 37% of the park's hardbottom communities where corals grow or could be established; much of the park's hardbottom communities (63%) would be outside the marine reserve zone and available for fishing. This zone would be within the boundaries of the original monument in which the National Park Service has the authority to change fishing regulations after consulting with the state and as described in chapter 1. The coral reef protected in this zone would contribute toward the Coral Reef Task Force goal of 20% of the reefs in Florida being included in marine reserves (U.S. Coral Reef Task Force 2000).

THE KEYS

Boca Chita Key

All of Boca Chita Key would be included in the visitor services / park administration zone. The management and use of the existing facilities would remain as described in alternative 1.

In addition, three historic structures on the key would be reused for park operations and visitor services. The number of kiosks providing interpretive information would be increased. More tours would be conducted, and there would be additional seasonal on-site interpretive opportunities.

The retaining wall on the north side of the island would be strengthened to maintain its current size, shape, and location.

The procedure allowing private use of some visitor facilities via a park-issued special use permit would continue.

Elliott Key

Elliott Key Harbor, including all existing visitor service and park administration facilities, would be included in the visitor services / park administration zone.

Management strategies and visitor services available on this key would be similar to those described in alternative 2, with the exceptions noted below.

A primitive connecting trail would be built to University Dock. The central trail leading south from the harbor to areas like Sandwich Cove could be improved but would not be universally accessible.

The environmental education program would be relocated to Adams Key as described in alternative 2. Ranger residences would remain.

Adams Key

All of Adams Key would be included in the visitor services / park administration zone. Existing facilities and uses would continue with improved visitor services as described in alternative 2.

The ranger-led environmental education program would be moved to Adams Key, and existing facilities would be improved to accommodate this change. Additional improvements to the key would be considered, as needed, to allow for this change. Visitor use of this key could be restricted during the environmental education season (generally November through March) to reduce conflicts. Moving the program to Adams Key would require facilities to be built or rehabilitated, and the appropriate environmental planning would occur before building.

Porgy Key

All of this island would be in the visitor services / park administration zone and would be managed as described in alternative 2.

Other Keys

Several keys would be included in the nature observation zone—Soldier Key, the Ragged Keys, Sands Key, Rubicon Keys, Reid Key, Old Rhodes Key, Totten Key, Gold Key, East Arsenicker Key, Long Arsenicker Key, Mangrove Key, and several smaller unnamed keys around Jones Lagoon.

West Arsenicker Key, Arsenicker Key, the water extending out 500 feet from these keys, and Swan Key would be included in the sensitive resource zone (and marked by dayboards or buoys) to protect exceptional and sensitive natural or cultural resources. Visitors would not be allowed in these areas, but research could occur under a science permit issued by the park.

0 1 2 Kilometers
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Map not for navigation

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Note 2: To show visually, the size of zone colors have been enlarged in certain areas.

Note 3: Some areas in the Park Boundary are not NPS owned but do not appear at this map scale. Zoning shown would not apply to non NPS lands unless they were acquired from a willing seller.

Map Key to Water Features and Landmarks

Water Depths: 0-6 feet (0-1.8 meters); 6-12 feet (1.8-3.6 meters); Over 12 feet (Over 3.6 meters)

Shallows and Reefs: Shoal or spoil area; Coral reef near water surface; Coral reefs also lie deeper below water surface.

Aids to Navigation (entering from seaward): Red — Port side lateral marks (even numbered); Other buoy. Green — Starboard side lateral marks (odd numbered); Daymarker.

Other Aids and Landmarks: Light; Danger Shoal; Tower; Mooring buoy

Light color: R Red, G Green, W White, Y Yellow

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Alternative 3

Biscayne National Park

United States Department of the Interior - National Park Service

DSC / October 2013 - Modified April 2015 / 169 - 20055

ALTERNATIVE 4

CONCEPT

This alternative would emphasize strong natural and cultural resource protection while providing a diversity of visitor experiences. Visitor opportunities in this alternative would range from the challenges of exploring the natural environment alone to the conveniences of built surroundings. A limited amount of moderate resource impacts would be tolerated in high-use areas of the park. Some areas would be closed to visitors to protect sensitive resources and allow wildlife a respite from human contact. Other areas, such as Legare Anchorage, would be reserved for limited types of visitor use.

This alternative includes a marine reserve zone where fishing is prohibited. The purpose of the marine reserve zone is to provide visitors with the opportunity to experience a healthy, natural coral reef, with larger and more numerous tropical reef fish and an ecologically intact reef system. Recreational fishing opportunities would continue to be available in the majority of park waters including in the approximately 70% of park coral reef areas (or 37% of the park's hardbottom habitats), which would be outside the marine reserve zone.

Taking action in this alternative to protect reefs from other pressures such as overfishing and physical damage from fishing gear, anchoring, and vessel groundings might also increase reef resiliency, potentially delaying the effects of global-scale stressors such as climate change, ocean acidification, and land-based sources of pollution (Jackson et al. 2014).

The discussion of actions common to all alternatives, such as Stiltsville, the Miami visitor center, Ragged Keys, and Black Point Jetty, are part of this alternative.

THE MAINLAND

Convoy Point would be in the visitor services / park administration zone and remain the park's primary administrative and visitor services area on the mainland, as described in alternative 1. If additional administrative space were needed, some functions would be expanded on-site while an alternate location in the local community would be studied for moving other functions and facilities.

A boardwalk and viewing platform would be built near Convoy Point to interpret the dwarf mangrove and marsh ecosystems. Site-specific environmental planning would be conducted before constructing the boardwalk, including efforts to avoid and minimize impacts to the mangroves. Site-specific environmental planning would be conducted before construction.

The visitor center boardwalk and jetty would be improved for safety and visitor access. These improvements would consist of benches and shade structures.

The mainland area between Convoy Point and Black Point County Park would be zoned multiuse (land) and the remainder would be nature observation zone.

Miami Area Visitor Center

The park has long identified a need for a visitor contact station in northern Biscayne Bay to facilitate resource protection and education to park users. Possible locations of a satellite visitor education center include Coconut Grove and Virginia Key, both popular tourist destinations that are convenient to Miami residents. These properties are owned by the City of Miami

and Miami-Dade County, respectively, and are less than 5 miles from the park boundary.

The park has been approached by these and other government agencies, including the NOAA Fisheries, to partner with the National Park Service to open a visitor education center in one of these areas. This could include enhanced educational programming, expanded concession operations, sales outlets, and visitor contact opportunities. This action is still in the discussion stages. It is unknown what, if any, the National Park Service would be asked to contribute to construction or operational costs. At a minimum, the park may be able to provide some staffing and pay rent for the use of an existing facility. Any facility rental or construction would require site-specific environmental planning. As in all cases of proposed construction, the National Park Service (or other responsible agency) would prepare site-specific NEPA and other environmental compliance documents.

The general concept to provide a visitor center in the Miami area is desirable and thus is included in this alternative. However, actual implementation is being delayed because the current NPS capital investment strategy does not support new construction or significant capital outlays at this time. If or when such expenditures are possible at a future time, the concept of a visitor center in the Miami area will be pursued through partnership arrangements.

BAY AND OCEAN WATERS

The multiuse zone would be applied to most of the park's water acreage (see alternative 4 map). Midnight Pass would remain open and part of the multiuse zone. Visitors could engage in a wide variety of activities such as sightseeing, boating, fishing, scuba diving, snorkeling, swimming, paddling, hiking, picnicking, camping, and visiting shipwrecks.

There would be three slow speed zones in this alternative. The first would be parallel to the mainland and adjacent to the noncombustion engine use zone, between 500 and 1,000 feet from the shore, identical to alternatives 2 and 3. The second area would be along the bay side of Elliott Key beginning at Sands Key and extending south to Elliott Key Harbor, a larger area than described in alternatives 2 and 3. The third area would be along Caesar Creek, south of Adams Key to Porgy Key, including the navigational channel between markers 20 to 24.

Four shallow-water areas of the park would be included in the noncombustion engine use zone in alternative 4. The first area would follow the entire mainland shoreline, excluding the channels as described in alternative 2. The second area would be the waters offshore of West Arsenicker and Arsenicker Keys between 500 and 1,000 feet (the islands and first 500 feet of offshore water would be the sensitive resource zone). The third area would include the waters around the park's southern keys including the bay side of Old Rhodes and Totten, and near portions of Rubicon, Reid, Porgy, and Swan Keys. The fourth area would include West, Middle, and East Featherbed Banks. Boats equipped with combustion engines could be used when propelled by push-pole or electric trolling motor, with outboard engine tilted up.

Legare Anchorage

In alternative 4, Legare Anchorage would be reduced to about 1 square mile and included in the sensitive underwater archeological zone, primarily to continue protecting underwater cultural resources. To facilitate protection and make it easier for boaters to identify, the area would be delineated by latitude and longitude lines and marked by dayboards or buoys. Travel through the area in a vessel would be allowed, but drifting, mooring, anchoring, and entering the water would not. Recreational hook-and-line fishing would be allowed while trolling. Commercial fishing and trapping would not

be allowed. This area could be used for permitted research activities.

Marine Reserve Zone

The management objective for the marine reserve zone would be to provide swimmers, snorkelers, scuba divers, and those who ride a glass-bottom boat the opportunity to experience a healthy, natural coral reef with larger and more numerous tropical reef fish and an ecologically intact reef system.

A marine reserve is a no-take area that functions as a long-term management approach that improves the size and quantity of fish and provides habitat and ecosystem protection and preservation (Bohnsack 1994; Bohnsack and Ault 1996; Halpern 2003).

Scientific data indicate that no-take zones are more effective at reducing mortality—especially for reef species—than other methodologies, including catch and release, slot limits, etc. For example, the National Park Service, State of Florida, and other entities engaged in a scientific evaluation of the Dry Tortugas National Park Research Natural Area, a no-take reserve. In 2012, they found that the size of red grouper, mutton snapper, yellowtail snapper, and hogfish increased since implementation of the research natural area. In contrast, abundance and size of these species either remained the same or decreased in nearby areas of the Tortugas Region that are open to fishing. Abundance of adult spawning-sized fish also increased within the research natural area, relative to other areas, contributing to reproduction and vitality of regional reef fish populations in South Florida (South Florida Natural Research Center et al. 2012). A recent study found similar increases in size and abundance in marine reserves in the Tortugas Region, including the research natural area, which indicates the merits of marine reserves for the exploited species of red grouper, black grouper, mutton snapper, yellowtail snapper, and hogfish. An added benefit of the reserves in this region was the spillover effect in which areas surrounding the reserves exhibited larger fish populations, both in size and density (Ault et al. 2013).

Experience with marine reserves in Florida and elsewhere indicate that a well-designed marine reserve zone is a scientifically valid approach to restoring fish populations and would likely enable visitors to experience larger and more numerous fish at Biscayne National Park.

Biscayne National Park reefs face a number of serious threats that the National Park Service has no authority to either regulate or manage, including ocean acidification and other effects of climate change, physical damage from derelict fishing gear, and pollution. The National Park Service anticipates that establishing a marine reserve zone would give park reefs the greatest opportunity for reef ecosystem recovery in order to be resilient to these external threats (Jackson 2014).

The marine reserve zone would provide important research opportunities to monitor the difference in reef ecosystem health and visitor experience compared to areas where fishing occurs (see appendix E for more information on the marine reserve zone).

The marine reserve zone would allow visitors the opportunity to participate in reef activities such as boating, snorkeling, scuba diving, underwater photography, and nature viewing. Boats would have easy access via Caesar Creek and Hawk Channel. Anchoring would be allowed to continue in this zone until mooring buoys are phased in. Recreational and commercial fishing would be prohibited in this zone to encourage long-term protection of the reef ecosystem. Opportunities for spearfishing lionfish or other exotic invasive species identified by the park would continue in this zone consistent with the *Fishery Management Plan*. For more information on the *Fishery Management Plan*, please visit http://www.nps.gov/bisc/parkmgmt/fishery-management-plan.htm.

In 2009, the park held three public workshops to share possible criteria for determining the size, shape, and location of a marine reserve zone and asked the public to draw possible zones on park maps. These public-proposed maps were then analyzed by marine scientists from universities, NOAA Fisheries, and the National Park Service and ranked in order of effectiveness for reaching zone goals. The National Park Service then used an interdisciplinary team to propose the final zone size, shape, and location based on the scientists' rankings of the public-proposed zones. See appendix E for more details on the criteria and process.

This zone is the same size, shape, and location as presented in alternative 3. The marine reserve zone would be between Hawk Channel and the park's eastern boundary, extending from Pacific Reef north to Long Reef (10,502 acres). The proposed marine reserve zone would be about 6% of the waters of the park and about 37% of the park's hardbottom communities, where corals grow or could be established; much of the park's hardbottom communities (63%) would be outside the zone and available for fishing. The marine reserve zone would be within the boundaries of the original monument in which the National Park Service has the authority to change fishing regulations after consulting with the state, as described in chapter 1. The coral reef protected in this zone would contribute toward the Coral Reef Task Force goal of 20% of the reefs in Florida being included in marine reserves (U.S. Coral Reef Task Force 2000).

THE KEYS

Boca Chita Key

The northern portion of Boca Chita Key, including the day use area, campground, and boat basin, would be part of the visitor services / park administration zone. The management and use of the existing facilities in this northern portion of the key would remain as described in alternative 2. There would be no new construction. The southern portion of Boca Chita Key would be managed according to the multiuse zone.

The private use of some visitor facilities via a park-issued special use permit would continue.

Elliott Key

Only the Elliott Key Harbor area would be included in the visitor services / park administration zone. The remainder would be in the multiuse zone (land). Elliott Key would continue to be open to visitors to dock (both day use and overnight docking/ boat camping), picnic, hike, camp, access restrooms, and obtain potable water, as described in alternatives 1, 2, and 3.

Current visitor services and park administration facilities would continue to be used, but the specific uses of these facilities could change to improve efficiency, including opening a small visitor contact station in the multiuse building that currently houses the environmental education program. The park would continue to use Elliott Key as the main location for its environmental education program and to use Adams Key as a back-up location.

A staging area for paddlecraft might be built on the Elliott Key developed area, allowing visitors to be shuttled by motorboat to the key and depart from there to explore the island shorelines.

The Breezeway Loop Trail and boardwalk would be made universally accessible. The ranger residences would remain.

Adams Key

Only the southern portion of Adams Key that includes the dock, day use/park administration area, pavilion, restrooms, and the two ranger residences would be part of

the visitor services / park administration zone. Existing facilities and uses would continue as described in alternative 1. A staging area for paddlecraft might be built at the Adams Key developed area, allowing visitors to explore the island shorelines.

In this alternative, the park could move the environmental education program to Adams Key. Additional facilities may need to be built or rehabilitated, and appropriate environmental planning would occur before construction.
The northern portion of this key would be in the multiuse zone and managed accordingly.

Porgy Key

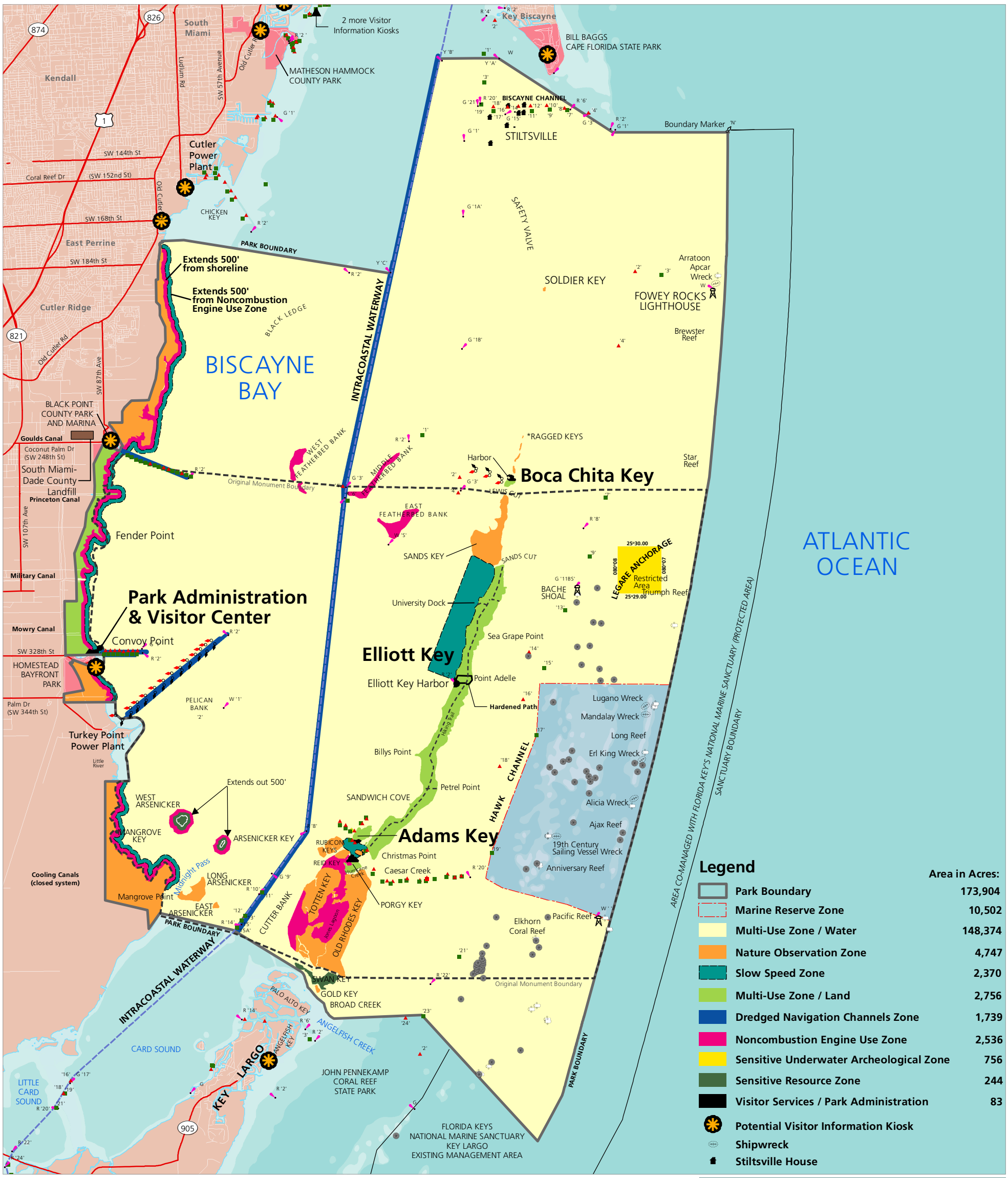
Only the northern end of Porgy Key would be placed in the visitor services / park administration zone. The ruins from the old Jones homesite would be maintained and interpreted on-site. A dock for paddlecraft would be established.

The southern end of the key would be in the multiuse zone and would be managed as described in this alternative.

Other Keys

Several keys would be included in the nature observation zone—Soldier Key, the Ragged Keys, Sands Key, Rubicon Keys, Reid Key, Old Rhodes Key, Totten Key, Gold Key, East Arsenicker Key, Long Arsenicker Key, Mangrove Key, and several smaller unnamed keys around Jones Lagoon.

West Arsenicker Key, Arsenicker Key, the water extending out 500 feet from these keys, and Swan Key would be included in the sensitive resource zone (and marked by dayboards or buoys) to protect exceptional and sensitive natural or cultural resources. Visitors would not be allowed in these areas, but research could occur under a science permit issued by the park.



0 1 2 Kilometers
0 1 2 Statute Miles
0 1 2 Nautical Miles

Map not for navigation

The NPS makes no warranty, express or implied, related to the accuracy or content of this map.

Note 1: Existing conditions and some features such as the locations of shoals, reefs, and shallow coral areas, may be considered unchanged.

Note 2: To show visually, the size of zone colors have been enlarged in certain areas.

Note 3: Some areas in the Park Boundary are not NPS owned but do not appear at this map scale. Zoning shown would not apply to non NPS lands unless they were acquired from a willing seller.

Map Key to Water Features and Landmarks

Water Depths: 0-6 feet (0-1.8 meters); 6-12 feet (1.8-3.6 meters); Over 12 feet (Over 3.6 meters)

Shallows and Reefs: Shoal or spoil area; Coral reef near water surface; Coral reefs also lie deeper below water surface.

Aids to Navigation (entering from seaward): Red — Port side lateral marks (even numbered); Other buoy. Green — Starboard side lateral marks (odd numbered); Daymarker.

Other Aids and Landmarks: Light; Danger Shoal; Tower; Mooring buoy

Light color: R Red, G Green, W White, Y Yellow

*RAGGED KEYS #2, #3, and #5 are Private Properties

Alternative 4

Biscayne National Park

United States Department of the Interior - National Park Service

DSC / October 2013 - Modified April 2015 / 169 - 20056

ALTERNATIVE 5

CONCEPT

The park would be managed to promote the protection of natural and cultural resources, including taking actions to optimize conditions for protection and restoration. Natural processes would prevail, except when management actions were needed to preserve and protect significant cultural resources. This alternative would provide the highest level of resource protection and still authorize a level of visitor services greater than the no-action alternative. Visitor access and activities would be highly managed for resource protection while still enabling visitors to participate in a variety of activities. To accomplish this variety, a permit system would be used to provide an opportunity to experience a sense of solitude in the bay, in one portion of the park. Other areas, such as Legare Anchorage, would offer diverse visitor experiences and recreational activities. Some areas would be closed to visitors to protect sensitive resources and provide wildlife a respite from human contact. The built environment would be limited to basic visitor safety and services and would be geographically concentrated or outside park boundaries.

This alternative includes a marine reserve zone where fishing is prohibited. The purpose of the marine reserve zone is to provide visitors with the opportunity to experience a healthy, natural coral reef, with larger and more numerous tropical reef fish and an ecologically intact reef system. Recreational fishing opportunities would continue to be available in the majority of park waters, including the approximately 60% of park coral reef areas (77% of park hardbottom habitats), which would be outside the marine reserve zone.

Taking action in this alternative to protect reefs from other pressures such as overfishing; land-based sources of pollution; and physical damage from fishing gear, anchoring, and vessel groundings might increase reef resiliency, potentially delaying the effects of global-scale stressors such as climate change and ocean acidification.

The discussion of actions common to all alternatives, such as Stiltsville, Ragged Keys, and Black Point Jetty, are a part of this alternative.

THE MAINLAND

Convoy Point would be in the visitor services / park administration zone and remain the park's primary administrative and visitor services area on the mainland, as described in alternative 1.

If additional administrative space were needed, selected administrative functions currently accommodated at this location might be moved out of the park and to the local community, while other functions would be expanded on-site.

The visitor center boardwalk and jetty could be upgraded.

All of the remaining mainland portion of the park would be in the nature observation zone.

Miami Area Visitor Center

The park has long identified a need for a visitor contact station in northern Biscayne Bay to facilitate resource protection and education to park users. Possible locations of a satellite visitor education center include Coconut Grove and Virginia Key, both popular tourist destinations that are convenient to Miami residents. These properties are owned by the City of Miami

and Miami-Dade County, respectively, and are less than 5 miles from the park boundary.

The park has been approached by these and other government agencies, including NOAA Fisheries, to partner with the National Park Service to open a visitor education center in one of these areas. This could include enhanced educational programming, expanded concession operations, sales outlets, and visitor contact opportunities. This action is still in the discussion stages. It is unknown what, if any, the National Park Service would be asked to contribute to construction or operational costs. At a minimum, the park may be able to provide some staffing and pay rent for the use of an existing facility. Any facility rental or construction would require site-specific environmental planning. As in all cases of proposed construction, the National Park Service (or other responsible agency) would prepare site-specific NEPA and other environmental compliance documents.

The general concept to provide a visitor center in the Miami area is desirable and thus is included in this alternative. However, actual implementation is being delayed because the current NPS capital investment strategy does not support new construction or significant capital outlays at this time. If or when such expenditures are possible at a future time, the concept of a visitor center in the Miami area would be pursued through partnership arrangements.

BAY AND OCEAN WATERS

The multiuse zone (water) would be applied to most of the park's water acreage (see alternative 5 map). Visitors could engage in various recreational activities such as sightseeing, boating, fishing, scuba diving, snorkeling, swimming, paddling, hiking, picnicking, camping, and visiting some historic sites and shipwrecks.

Popular snorkeling, scuba diving, and anchoring sites would be evaluated for installation of mooring buoys. This would provide targeted resource protection and help disperse use at these locations. This would also limit the number of boats in these specific locations.

There would be three slow speed zones in this alternative. The first would extend the length of Elliott Key on the bay side, from Sands Key to

A

Adam's Key, 100

. The second such zone would include a triangular area (see alternative 5 map) north of Stiltsville. The third area would be along Caesar Creek, south of Adams Key to Porgy Key, including the navigational channel between markers 20 to 24.

In this alternative, four areas would be included in the noncombustion engine use zone. The first area would follow the entire mainland shoreline from the northern park boundary south to Midnight Pass and extend east about 1,000 feet from the shore, excluding channels. This zone also would be applied to the waters offshore of West Arsenicker and Arsenicker Keys between 500 and 1,000 feet (the islands and 500 feet of offshore water would be in the sensitive resource zone). The third noncombustion engine use zone would include the waters around the southern keys such as Totten, Rubicon, Reid, and Porgy Keys and the bay side of Old Rhodes Key. Jones Lagoon and Broad Creek would be within this zone. The fourth area would include West, Middle, and East Featherbed Banks. These latter areas would be delineated by markers. Boats equipped with combustion engines could be used when propelled by push-pole or electric trolling motor, with outboard engine tilted up.

The access-by-permit zone would provide visitors with relative solitude by using a permit system to limit the number of people who could be in a specified area at a time. The one area included under this alternative currently receives low visitation and would provide a place of low-density use as the population of South Florida increases. This area would be in the northwest corner of the park, immediately north of Black Point Channel.

Legare Anchorage

In alternative 5, Legare Anchorage would be reduced to about 1 square mile and included in the sensitive underwater archeological zone, primarily to continue protecting underwater cultural resources. To facilitate protection and make it easier for boaters to identify, the area would be delineated by latitude and longitude lines and marked by dayboards or buoys. Travel through the area in a vessel would be allowed, but drifting, mooring, anchoring, and entering the water would not. Recreational hook-and-line fishing would be allowed while trolling. Commercial fishing and trapping would not be allowed. This area could be used for permitted research activities.

Marine Reserve Zone

The management objective for the marine reserve zone would be to provide swimmers, snorkelers, scuba divers, and those who ride a glass-bottom boat the opportunity to experience a healthy, natural coral reef with larger and more numerous tropical reef fish and an ecologically intact reef system.

A marine reserve is a no-take area that functions as a long-term management approach, which improves the size and quantity of fish and provides habitat and ecosystem protection and preservation (Bohnsack 1994; Bohnsack and Ault 1996; Halpern 2003).

Scientific data indicate that no-take zones are more effective at reducing mortality—especially for reef species—than other methodologies, including catch and release, slot limits, etc. For example, the National Park Service, State of Florida, and other entities engaged in a scientific evaluation of the Dry Tortugas National Park Research Natural Area, a no-take reserve. In 2012, they found that the size of red grouper, mutton snapper, yellowtail snapper, and hogfish increased since implementation of the research natural area. In contrast, abundance and size of these species either remained the same or decreased in nearby areas of the Tortugas Region that are open to fishing. Abundance of adult spawning-sized fish also increased within the research natural area relative to other areas, contributing to reproduction and vitality of regional reef fish populations in South Florida (South Florida Natural Research Center et al. 2012). A recent study found similar increases in size and abundance in marine reserves in the Tortugas Region, including the research natural area, which indicates the merits of marine reserves for the exploited species of red grouper, black grouper, mutton snapper, yellowtail snapper, and hogfish. An added benefit of the reserves in this region was the spillover effect, in which areas surrounding the reserves exhibited larger fish populations, both in size and density (Ault et al. 2013).

Experience with marine reserves in Florida and elsewhere indicate that a well-designed marine reserve zone is a scientifically valid approach to restoring fish populations and would likely enable visitors to experience larger and more numerous fish at Biscayne National Park.

The park's reefs face a number of serious threats that the National Park Service has no authority to either regulate or manage, including ocean acidification and other effects of climate change, physical damage from derelict fishing gear, and pollution. The National Park Service anticipates that establishing a marine reserve would give park reefs the greatest opportunity for reef ecosystem recovery in order to be resilient to these external threats (Jackson 2014).

The marine reserve zone would provide important research opportunities to monitor the difference in reef ecosystem health and visitor experience compared to areas where fishing occurs (see appendix E for more information on the marine reserve zone).

The marine reserve zone would allow visitors the opportunity to participate in reef activities such as boating, snorkeling, scuba diving, underwater photography, and nature viewing. Boats would have easy access via Caesar Creek and Hawk Channel. Anchoring would be allowed to continue in this zone until mooring buoys are phased in. Recreational and commercial fishing would be prohibited in this zone to encourage long-term protection of the reef ecosystem. Opportunities for spearfishing lionfish or other invasive species identified by the park would continue in this zone consistent with the *Fishery Management Plan*. For more information on the *Fishery Management Plan*, please visit http://www.nps.gov/bisc/parkmgmt/fishery-management-plan.htm.

In 2009, the park held three public workshops to share possible criteria for determining the size, shape, and location for a marine reserve zone, and asked the public to draw possible zones on park maps. These public-proposed maps were then analyzed by marine scientists from universities, NOAA Fisheries, and the National Park Service and ranked in order of effectiveness of reaching zone goals. The National Park Service then used an interdisciplinary team to propose the final zone size, shape, and location based on the scientists' rankings of the public-proposed zones. See appendix E for more details on the criteria and process.

In alternative 5, the largest marine reserve zone of any alternative would be established between Elliott Key and the park's eastern boundary, extending north from Caesar Creek and Pacific Reef to marker 13 (approximately 21,884 acres). The proposed marine reserve zone would be about 14% of the waters of the park, and about 27% of the park's hardbottom communities, where corals grow or could be established; much of the park's hardbottom communities (73%) would be outside the zone and available for fishing. This zone would be within the boundaries of the original monument, in which the National Park Service has the authority to change fishing regulations after consulting with the state, as described in chapter 1. The coral reef protected in this zone would contribute toward the Coral Reef Task Force goal of 20% of the reefs in Florida being included in marine reserves (U.S. Coral Reef Task Force 2000).

THE KEYS

Boca Chita Key

Similar to alternative 4, the northern portion of Boca Chita Key would be included in the visitor services / park administration zone and managed accordingly. The southern portion of Boca Chita Key would be designed and managed under the multiuse zone.

There would be no new construction. The private use of some visitor facilities via a park-issued special use permit would continue.

Elliott Key

Only the immediate Elliott Key Harbor area would be included in the visitor services / park administration zone. Current visitor services and park administration facilities would continue to be used, but the specific uses of these facilities could change to improve efficiency. The park would continue to use Elliott Key as the main location for its environmental education program and to use Adams Key as a back-up location. A staging area for paddlecraft might be built on the Elliott Key developed area, allowing visitors to be shuttled by motorboat to the key and depart from there to explore the island shorelines.

The remainder of Elliott Key would be in the nature observation zone.

Ranger residences would remain, and the central hiking trail would remain unhardened.

Adams Key

Only the southern portion of Adams Key that includes the dock, day use / park administration area, pavilion, restrooms, and the two ranger residences would be part of the visitor services / park administration zone. Existing facilities and uses would continue as described in alternative 1. A staging area for paddlecraft might be built at the Adams Key developed area, allowing visitors to explore the island shorelines. This new service likely would be provided by a commercial visitor services operator.

Should the park opt to move the program to Adams Key, facilities might need to be built or rehabilitated, and the appropriate environmental planning would occur before building.

The northern portion of this key would be in the multiuse zone and managed accordingly.

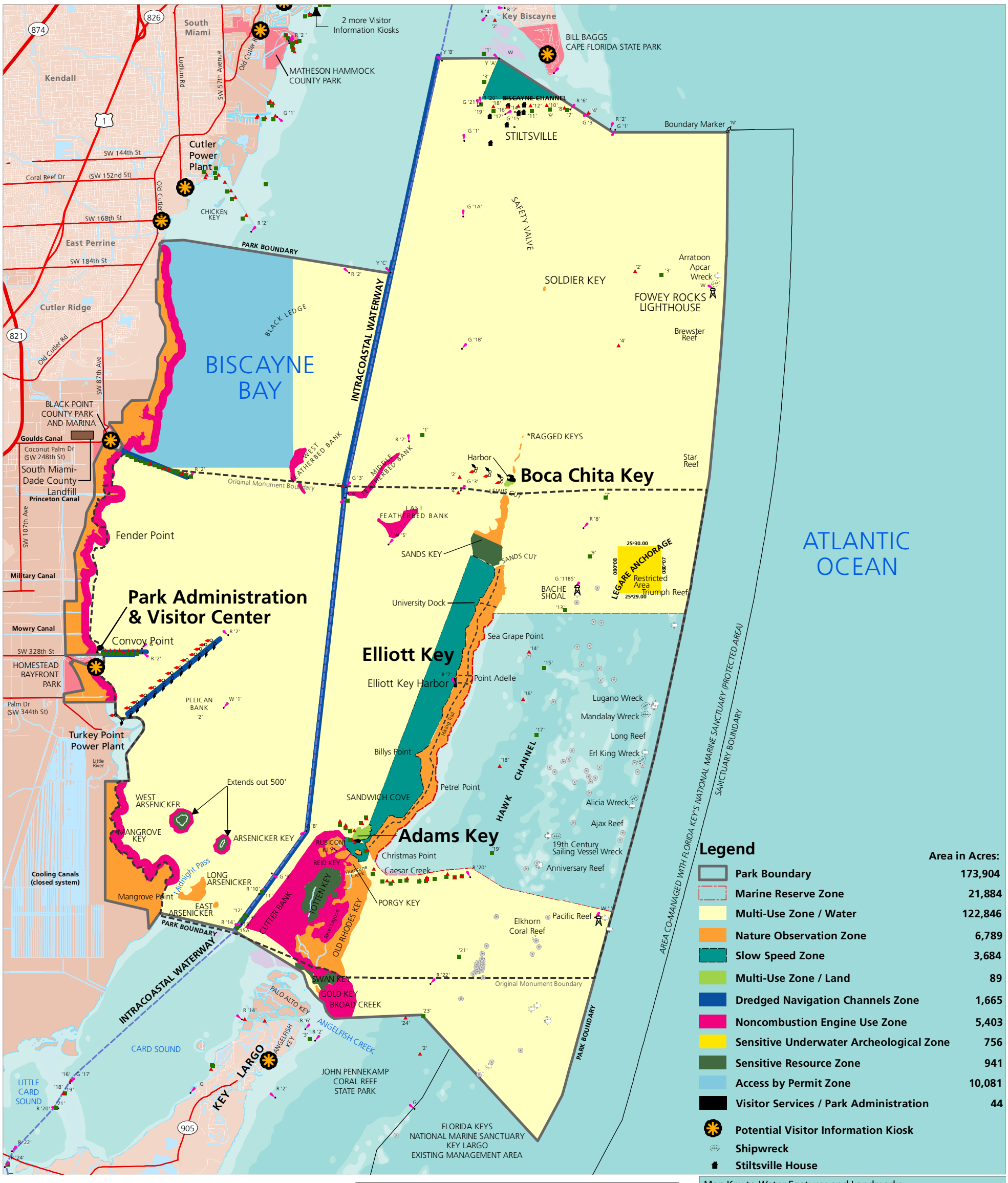
Porgy Key

Porgy Key would be in the nature observation zone in this alternative. Current management of the ruins associated with the historic Jones homesite would continue. Interpretation of the Jones site via waysides or ranger interaction could take place on Adams Key.

Other Keys

Several keys would be included in the nature observation zone—Soldier Key, the Ragged Keys, Sands Key, Rubicon Keys, Reid Key, Old Rhodes Key, Gold Key, East Arsenicker Key, Long Arsenicker Key, Mangrove Key, Porgy Key, and several smaller unnamed keys around Jones Lagoon.

West Arsenicker Key, Arsenicker Key, the water extending out 500 feet from these keys, Swan Key, and Totten Key would be included in the sensitive resource zone (and marked by dayboards or buoys) to protect exceptional and sensitive natural or cultural resources. Visitors would not be allowed in these areas, but research could occur under a science permit issued by the park.



N W E S BISCAYNE N.P.

0 1 2 Kilometers
0 1 2 Statute Miles
0 1 2 Nautical Miles

Map not for navigation

The NPS makes no warranty, express or implied, related to the accuracy or content of this map.

Note 1: Existing conditions and some features such as the locations of shoals, reefs, and shallow coral areas, may be considered unchanged.

Note 2: To show visually, the size of zone colors have been enlarged in certain areas.

Note 3: Some areas in the Park Boundary are not NPS owned but do not appear at this map scale. Zoning shown would not apply to non NPS lands unless they were acquired from a willing seller.

Map Key to Water Features and Landmarks

Water Depths: 0-6 feet (0-1.8 meters); 6-12 feet (1.8-3.6 meters); Over 12 feet (Over 3.6 meters)

Shallows and Reefs: Shoal or spoil area; Coral reef near water surface; Coral reefs also lie deeper below water surface.

Aids to Navigation (entering from seaward): Red — Port side lateral marks (even numbered); Other buoy. Green — Starboard side lateral marks (odd numbered); Daymarker.

Other Aids and Landmarks: Light; Danger Shoal; Tower; Mooring buoy

Light color: R Red, G Green, W White, Y Yellow

*RAGGED KEYS #2, #3, and #5 are Private Properties

Alternative 5

Biscayne National Park

United States Department of the Interior - National Park Service

DSC / October 2013 - Modified April 2015 / 169 - 20057

ALTERNATIVE 6

CONCEPT

This alternative would emphasize strong natural and cultural resource protection while providing a diversity of visitor experiences. Visitor opportunities in this alternative would range from the challenges of exploring the natural environment alone to the convenience of built surroundings. A limited amount of resource impacts would be tolerated in high-use areas of the park. Some visitor activities would be restricted in certain areas to protect sensitive resources and allow wildlife a respite from human contact. Other areas, such as Legare Anchorage, would be reserved for limited types of visitor use.

This alternative includes a special recreation zone that would be managed as part of an adaptive management strategy to achieve the goal of a healthier coral reef ecosystem within the zone to provide a more enjoyable and diverse visitor experience.

Taking action in this alternative to protect reefs from other pressures such as overfishing; land-based sources of pollution; and physical damage from commercial fishing gear, anchoring, and vessel groundings might increase reef resiliency, potentially delaying the effects of global-scale stressors such as climate change and ocean acidification (Jackson 2014).

Under alternative 6, some types of fishing would be prohibited and fishing pressure would be limited via permits in the special recreation zone. An adaptive management strategy (appendix E) is used to evaluate the effectiveness of this approach at 3-, 5-, 8-, and 10-year intervals after implementation, with the option of applying management actions to affect fishing pressure as indicated by monitoring data. Following the 10-year adaptive management period for the special recreation zone, the National Park Service would consider monitoring data and consult with the FWC, NOAA Fisheries, other relevant agencies, and an expert panel. At that point, the National Park Service would decide whether to continue adaptive management strategies for a special recreation zone or implement a marine reserve zone.

The discussion of actions common to all alternatives, such as Stiltsville, Ragged Keys, and Black Point Jetty, are a part of this alternative.

THE MAINLAND

Convoy Point would be in the visitor services / park administration zone and remain the park's primary administrative and visitor services area on the mainland, as described in alternative 1. If additional administrative space were needed, some functions would be expanded on-site while an alternate location in the local community would be studied for moving other functions and facilities.

Additionally, the park would actively seek opportunities to develop a modern visitor education facility outside Convoy Point (in the Miami area).

A boardwalk and viewing platform would be built near Convoy Point to interpret the dwarf mangrove and marsh ecosystems. Site-specific environmental planning would be conducted before constructing the boardwalk.

The visitor center boardwalk and jetty could be improved for safety and visitor access. These improvements would consist of benches and shade structures.

The mainland area between Convoy Point and Black Point County Park would be zoned multiuse, totaling 2,756 acres of land, and the

remainder would be a nature observation zone, totaling 4,747 acres of land.

Miami Area Visitor Center

The park has long identified a need for a visitor contact station in northern Biscayne Bay to facilitate resource protection and education to park users. Possible locations of a satellite visitor education center include Coconut Grove and Virginia Key, both popular tourist destinations that are convenient to Miami residents. These properties are owned by the City of Miami and Miami-Dade County, respectively, and are less than 5 miles from the park boundary.

The park has been approached by these and other government agencies, including NOAA Fisheries, to partner with the National Park Service to open a visitor education center in one of these areas. This could include enhanced educational programming, expanded concession operations, sales outlets, and visitor contact opportunities. This action is still in the discussion stages. It is unknown what, if any, the National Park Service would be asked to contribute to construction or operational costs. At a minimum, the park may be able to provide some staffing and pay rent for the use of an existing facility. Any facility rental or construction would require site-specific environmental planning. As in all cases of proposed construction, the National Park Service (or other responsible agency) would prepare site-specific NEPA and other environmental compliance documents.

The general concept to provide a visitor center in the Miami area is desirable and thus is included in this alternative. However, actual implementation is being delayed because the current NPS capital investment strategy does not support new construction or significant capital outlays at this time. If or when such expenditures are possible at a future time, the concept of a visitor center in the Miami area would be pursued through partnership arrangements.

BAY AND OCEAN WATERS

The multiuse zone would be applied to most of the park's water acreage (see alternative 6 map). Midnight Pass would remain open and part of the multiuse zone. Visitors could engage in a wide variety of activities such as sightseeing, boating, fishing, scuba diving, snorkeling, swimming, paddling, hiking, picnicking, camping, and visiting shipwrecks. The multiuse zone includes 144,537 acres of water, which is 83% of the park.

There would be three slow speed zones in this alternative. The first one would be parallel to the park's mainland shoreline extending out 1,000 feet from the park's northern boundary to the north end of Midnight Pass near the park's southern boundary. This would eliminate the need for two sets of navigation markers that would have been needed to delineate both a slow speed zone and noncombustion engine use zone as proposed in alternative 4, lessen the chance of boater confusion, and maintain boater access while still providing protection for the mangrove nursery habitat for important reef fish, Florida manatees, and safety for recreational paddlers. This zone was developed in consultation with the FWC and would be consistent with the *Florida Manatee Recovery Plan* (USFWS 2001), and the *Dade County Manatee Protection Plan* (DERM 1996). The second area would be along the bayside of Elliott Key beginning at Sands Key and extending south to Elliott Key Harbor, identical to alternative 4. The third area would be along Caesar Creek, south of Adams Key to Porgy Key, including the navigational channel between markers 20 to 24, same as alternative 4.

Two shallow-water areas of the park would be included in the noncombustion engine use zone in alternative 6. This zone includes the waters around the park's southern keys including the bay side of Old Rhodes and Totten Keys, and near portions of Rubicon, Reid, Porgy, and Swan Keys. It would also include West, Middle, and East Featherbed Banks. Boats equipped with combustion engines could be used when propelled by

push-pole or electric trolling motor, with outboard engine tilted up. The noncombustion engine use zone totals 903 acres, or less than 1% of the park.

Legare Anchorage

In alternative 6, Legare Anchorage would be reduced to about 1 square mile and included in the sensitive underwater archeological zone, primarily to continue protecting underwater cultural resources. To facilitate protection and make it easier for boaters to identify, the area would be delineated by latitude and longitude lines and marked by dayboards or buoys. Travel through the area in a vessel would be allowed, but drifting, mooring, anchoring, and entering the water would not. Hook-and-line fishing would be allowed while trolling. Trapping would not be allowed. This area could be used for permitted research activities.

Special Recreation Zone

In alternative 6, the special recreation zone would extend from Hawk Channel to the park's eastern boundary, extending from 2 miles south of Pacific Reef north to Long Reef (14,585 acres). The proposed special recreation zone in alternative 6 would be about 8% of the park. Thirty-six percent of the park's hardbottom habitats, where corals grow or could be established, would be managed under the special recreation use zone with a closed season; 64% would remain available for fishing per state regulations.

Within the special recreation zone, the following activities and limitations would be put into effect through rule-making processes:

- recreational fishing allowed year-round with a special permit required
- hook-and-line fishing only, with exception of lampara nets for the ballyhoo fishery
- no grouper harvest allowed
- no lobster harvest (recreational or commercial)
- no spearfishing, with the exception of the removal of exotic invasive lionfish or other invasive species identified by the park
- anchoring prohibited, additional mooring buoys to be installed
- all other state and federal fishing regulations apply
- no commercial fishing, with exception of the ballyhoo lampara net fishery
- snorkeling and scuba diving allowed
- active removal of marine debris
- initiation of a research and monitoring program to inform adaptive management of the zone
- adoption of an adaptive management strategy (see appendix E)

The special recreation zone would be implemented using an adaptive management strategy whereby resource conditions and fishing activities are monitored and management actions are reconsidered and adjusted on predefined intervals. A science and research strategy would be developed in the first three years of implementation to more clearly establish baseline conditions, thresholds for management actions, and monitoring protocols and metrics. Evaluation intervals at years 3, 5, and 8 would consider the need to potentially reduce the number of fishing permits to be issued for following years and the need to refine monitoring protocols to improve data quality for future evaluations. Also, the evaluation would consider adjustments to other management actions such as the location and number of mooring buoys and zone boundary markers, marine debris removal, public outreach efforts, and law enforcement efforts. Following the 10-year evaluation, the National Park Service, after consultation with the FWC and other relevant agencies, and consideration of the expert panel recommendations, would determine appropriate adaptive management adjustments in special recreation zone

management immediately following the panel report. This NPS decision may include relaxing regulations such as allowing grouper harvest or further restricting regulations to include possible conversion to a no-fishing marine reserve. The decision to either continue the adaptive management strategies or implement a marine reserve zone would be predicated on the monitoring data showing a sufficiently improved resource condition and that the park has met its goals for an improved visitor experience in the zone and the expectation that the trend would continue; otherwise, the marine reserve zone would be implemented to more immediately address the downward trend in resource conditions and/or visitor experience.

Dual permits would be required for fishing and take. A dual permit, anticipated to be a FWC special activity license / NPS special use permit, would be required for fishing and take in the special recreation zone (other than for lionfish harvested by approved spearing devices or hand-held nets). A maximum of 500 special activity licenses would be issued annually; currently set at 430 angling permits and 70 fishing guide permits. This number could be decreased or reallocated if needed. It is anticipated that the FWC would issue these permits on an annual lottery basis. The specifics for issuing these licenses have not been determined at this time. An educational component could be required for permit holders. Permit holders would be required to submit a monthly logbook with effort, catch, and harvest information.

As anchoring is prohibited under this alternative, additional mooring buoys would be added over time as needed to disperse visitor use and improve the safety of scuba diving operations. Mooring buoys may also be relocated periodically within the zone to redistribute fishing, snorkeling, and scuba diving impacts.

The special recreation zone would allow the lampara net commercial fishery for ballyhoo because this fishery does not physically impact coral reef habitat although there might be temporary noise impacts on reef organisms. Furthermore, there are only a small number of commercial fishers tied to this area with limited ability to easily relocate.

THE KEYS

Boca Chita Key

The northern portion of Boca Chita Key, including the day use area, campground, and boat basin, would be part of the visitor services / park administration zone. The management and use of the existing facilities in this northern portion of the key would remain as described in alternative 2. There would be no new construction. The southern portion of Boca Chita Key would be managed according to the multiuse zone.

The private use of some visitor facilities via a park-issued special use permit would continue.

Elliott Key

Only the Elliott Key Harbor area would be included in the visitor services / park administration zone. The remainder would be in the multiuse zone (land). Elliott Key would continue to be open to visitors to dock (both day use and overnight docking / boat camping), picnic, hike, camp, access restrooms, and obtain potable water, as described in alternatives 1, 2, and 3.

Current visitor services and park administration facilities would continue to be used, but the specific uses of these facilities could change to improve efficiency, including opening a small visitor contact station in the multiuse building that currently houses the environmental education program. The park would continue to use Elliott Key as the main location for its environmental education program and to use Adams Key as a back-up location.

A staging area for paddlecraft could be built on the Elliott Key developed area, allowing visitors to be shuttled by motorboat to the key and depart from there to explore the island shorelines.

The Breezeway Loop Trail and boardwalk would be made universally accessible. The ranger residences would remain.

Adams Key

Only the southern portion of Adams Key that includes the dock, day use / park administration area, pavilion, restrooms, and the two ranger residences would be part of the visitor services / park administration zone. Existing facilities and uses would continue as described in alternative 1. A staging area for paddlecraft might be built at the Adams Key developed area, allowing visitors to explore the island shorelines.

In this alternative, the park could move the environmental education program to Adams Key. Additional facilities may need to be built or rehabilitated, and appropriate environmental planning would occur before construction.

The northern portion of this key would be in the multiuse zone and managed accordingly.

Porgy Key

Only the northern portion of Porgy Key would be placed in the visitor services / park administration zone. The ruins from the old Jones homesite would be maintained and interpreted on-site. A dock for paddlecraft would be established.

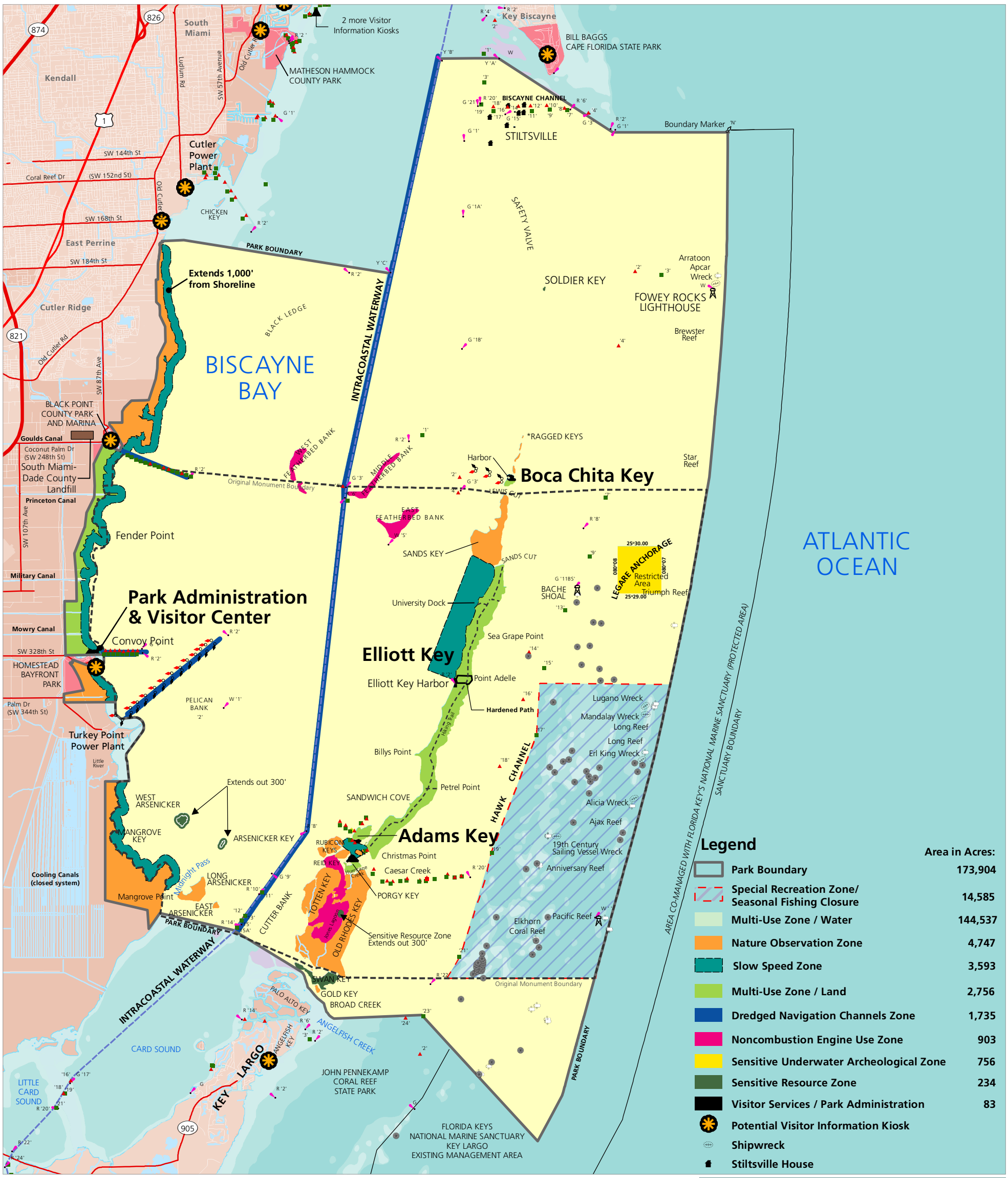
The southern portion of the key would be in the multiuse zone and would be managed as described in the multiuse zone in this alternative.

Other Keys

Several keys would be included in the nature observation zone—Ragged Keys, Sands Key, Rubicon Keys, Reid Key, Old Rhodes Key, Totten Key, Gold Key, East Arsenicker Key, Long Arsenicker Key, and Mangrove Key.

West Arsenicker Key, Arsenicker Key, the water extending out 300 feet from these keys, as well as Swan Key and Soldier Key would be included in the sensitive resource zone (and marked by dayboards or buoys) to accommodate motorboat use in a greater area around the currently closed islands while protecting the sensitive resource that is consistent with the best available science. While access to the general public would be prohibited, scientific research would continue to be allowed following NPS research permitting procedures.

At Jones Lagoon, the noncombustion engine use zone provides boater access and ease of navigation in the creeks of the area. The sensitive resource zone would extend for 300 feet around the small keys to protect the wading bird colonies in Jones Lagoon.



N W E S

0 1 2 Kilometers
0 1 2 Statute Miles
0 1 2 Nautical Miles

Map not for navigation

The NPS makes no warranty, express or implied, related to the accuracy or content of this map.

Note 1: Existing conditions and some features such as the locations of shoals, reefs, and shallow coral areas, may be considered unchanged.

Note 2: To show visually, the size of zone colors have been enlarged in certain areas.

Note 3: Some areas in the Park Boundary are not NPS owned but do not appear at this map scale. Zoning shown would not apply to non NPS lands unless they were acquired from a willing seller.

Map Key to Water Features and Landmarks

Water Depths: 0-6 feet (0-1.8 meters); 6-12 feet (1.8-3.6 meters); Over 12 feet (Over 3.6 meters)

Shallows and Reefs: Shoal or spoil area; Coral reef near water surface; Coral reefs also lie deeper below water surface.

Aids to Navigation (entering from seaward): Red — Port side lateral marks (even numbered); Other buoy. Green — Starboard side lateral marks (odd numbered); Daymarker.

Other Aids and Landmarks: Light; Danger Shoal; Tower; Mooring buoy

Light color: R Red, G Green, W White, Y Yellow

*RAGGED KEYS #2, #3, and #5 are Private Properties

Alternative 6

Biscayne National Park

United States Department of the Interior - National Park Service

DSC / October 2013 - Modified April 2015 / 169 - 20059

ALTERNATIVE 7

CONCEPT

This alternative is exactly the same as alternative 6, with the exception of some details specific to the administration of the special recreation zone.

This alternative would emphasize strong natural and cultural resource protection while providing a diversity of visitor experiences. Visitor opportunities in this alternative would range from the challenges of exploring the natural environment alone to the convenience of built surroundings. A limited amount of resource impacts would be tolerated in high-use areas of the park. Some visitor activities would be restricted in certain areas to protect sensitive resources and allow wildlife a respite from human contact. Other areas, such as Legare Anchorage, would be reserved for limited types of visitor use.

This alternative incorporates an adaptive management approach to the special recreation zone. Alternative 7 includes fishing limitations, including a seasonal fishing closure, to achieve the goal of a healthier coral reef ecosystem to provide a more enjoyable and diverse visitor experience.

Within the special recreation zone, some types of fishing would be prohibited altogether, and the area would be closed to recreational fishing during the summer months (June through September). This period is when fish that are caught and released are less likely to survive due to warm water conditions. An adaptive management strategy (appendix E) is used to evaluate the effectiveness of this approach at 3-, 5-, 8-, and 10-year intervals after implementation, with the option of implementing management actions as identified by an expert panel to affect fishing pressure as indicated by monitoring data. Following the 10-year adaptive management period for the special recreation zone, the National Park Service, after consultation with relevant agencies and consideration of expert panel recommendations, would decide whether to continue adaptive management strategies for a special recreation zone or implement a marine reserve zone.

The discussion of actions common to all alternatives, such as Stiltsville, Ragged Keys, and Black Point Jetty, are part of this alternative.

THE MAINLAND

Convoy Point would be in the visitor services / park administration zone and remain the park's primary administrative and visitor services area on the mainland, as described in alternative 1. If additional administrative space were needed, some functions would be expanded on-site, while an alternate location in the local community would be studied for moving other functions and facilities.

Additionally, the park would actively seek opportunities to develop a modern visitor education facility outside Convoy Point (in the Miami area).

A boardwalk and viewing platform would be built near Convoy Point to interpret the dwarf mangrove and marsh ecosystems. Site-specific environmental planning would be conducted before constructing the boardwalk.

The visitor center boardwalk and jetty could be improved for safety and visitor access. These improvements would consist of benches and shade structures.

The mainland area between Convoy Point and Black Point County Park would be zoned multiuse, totaling 2,756 acres of land, and the remainder would be a nature observation zone, totaling 4,747 acres of land.

Miami Area Visitor Center

The park has long identified a need for a visitor contact station in northern Biscayne Bay to facilitate resource protection and education to park users. Possible locations of a satellite visitor education center include Coconut Grove and Virginia Key, both popular tourist destinations that are convenient to Miami residents. These properties are owned by the City of Miami and Miami-Dade County, respectively, and are less than 5 miles from the park boundary.

The park has been approached by these and other government agencies, including NOAA Fisheries, to partner with the National Park Service to open a visitor education center in one of these areas. This could include enhanced educational programming, expanded concession operations, sales outlets, and visitor contact opportunities. This action is still in the discussion stages. It is unknown what, if any, the National Park Service would be asked to contribute to construction or operational costs. At a minimum, the park may be able to provide some staffing and pay rent for the use of an existing facility. Any facility rental or construction would require site-specific environmental planning. As in all cases of proposed construction, the National Park Service (or other responsible agency) would prepare site-specific NEPA and other environmental compliance documents.

The general concept to provide a visitor center in the Miami area is desirable and thus is included in this alternative. However, actual implementation is being delayed because the current NPS capital investment strategy does not support new construction or significant capital outlays at this time. If or when such expenditures are possible at a future time, the concept of a visitor center in the Miami area will be pursued through partnership arrangements.

BAY AND OCEAN WATERS

Actions are the same as those described for alternative 6.

The multiuse zone would be applied to most of the park's water acreage (see alternative 6 map). Midnight Pass would remain open and part of the multiuse zone. Visitors could engage in a wide variety of activities such as sightseeing, boating, fishing, scuba diving, snorkeling, swimming, paddling, hiking, picnicking, camping, and visiting shipwrecks. The multiuse zone includes 144,537 acres of water, which is 83% of the park.

There would be three slow speed zones in this alternative. The first one would be parallel to the park's mainland shoreline extending out 1,000 feet from the park's northern boundary to the north end of Midnight Pass near the park's southern boundary. This would eliminate the need for two sets of navigation markers that would have been needed to delineate both a slow speed zone and noncombustion engine use zone as proposed in alternative 4, lessen the chance of boater confusion, and maintain boater access while still providing protection for the mangrove nursery habitat for important reef fish, Florida manatees, and safety for recreational paddlers. This zone was developed in consultation with the FWC and would be consistent with the *Florida Manatee Recovery Plan* (USFWS 2001) and the *Dade County Manatee Protection Plan* (DERM 1996).The second area would be along the bayside of Elliott Key beginning at Sands Key and extending south to Elliott Key Harbor, identical to alternative 4. The third area would be along Caesar Creek, south of Adams Key to Porgy Key, including the navigational channel between markers 20 to 24, same as alternative 4.

Two shallow-water areas of the park would be included in the noncombustion engine use zone in alternative 7. This zone includes the waters around the park's southern keys including the bay side of Old Rhodes and Totten Keys, and near portions of Rubicon, Reid, Porgy, and Swan Keys. It would also

include West, Middle, and East Featherbed Banks.

Boats equipped with combustion engines could be used when propelled by push-pole or electric trolling motor, with outboard engine tilted up. The noncombustion engine use zone totals 903 acres, or less than 1% of the park.

Legare Anchorage

As in alternative 6, Legare Anchorage would be reduced to about 1 square mile and included in the sensitive underwater archeological zone, primarily to continue protecting underwater cultural resources. To facilitate protection and make it easier for boaters to identify, the area would be delineated by latitude and longitude lines and marked by dayboards or buoys. Travel through the area in a vessel would be allowed, but drifting, mooring, anchoring, and entering the water would not. Hook-and-line fishing would be allowed while trolling. Trapping would not be allowed. This area could be used for permitted research activities.

Special Recreation Zone

In alternative 7, the special recreation zone would extend from Hawk Channel to the park's eastern boundary, extending from 2 miles south of Pacific Reef, north to Long Reef (14,585 acres). The proposed special recreation zone in alternative 7 would comprise about 8% of the park. Thirty-six percent of the park's hardbottom habitats, where corals grow or could be established would be managed under the special recreation zone with a closed season, and 64% would remain available for fishing per state regulations.

Within the special recreation zone, the following activities and limitations would be put into effect through rule-making processes:

- recreational fishing prohibited during summer months
- hook-and-line fishing only, with the exception of lampara nets for the ballyhoo fishery
- no grouper harvest allowed
- no lobster harvest (recreational or commercial)
- no spearfishing, with the exception of the removal of exotic invasive species
- anchoring prohibited
- all other state and federal fishing regulations apply
- no commercial fishing, with the exception of the ballyhoo lampara net fishery
- snorkeling and scuba diving allowed
- active removal of marine debris
- initiation of a research and monitoring program to inform adaptive management of the zone
- adoption of an adaptive management strategy (see appendix E)

The special recreation zone would be implemented using an adaptive management strategy whereby resource conditions and fishing activities are monitored and management actions are reconsidered and adjusted at pre-defined intervals. A science and research strategy would be developed in the first three years of implementation to more clearly establish baseline conditions, thresholds for management actions, and monitoring protocols and metrics. These evaluation intervals at years 3, 5, and 8 would consider the need to refine monitoring protocols to improve data quality for future evaluations. Also, the evaluation would consider adjustments to management actions such as the location and number of mooring buoys and zone boundary markers, marine debris removal, public outreach efforts, and law enforcement efforts. Following the 10-year adaptive management period for the special recreation zone, the National Park Service would consider monitoring data and consult with state and federal agencies and an expert panel. At that point, the National Park

Service would decide whether to continue adaptive management strategies for a special recreation zone or implement a marine reserve zone. The decision to either continue the adaptive management strategies or implement a marine reserve zone would be predicated on the monitoring data showing a sufficiently improved resource condition and that the park has met its goals for an improved visitor experience in the zone; and the expectation that the trend would continue; otherwise, the marine reserve zone would be implemented to more immediately address the downward trend in resource conditions and/or visitor experience.

During the seasonal closure, angler access would be barred from June through September when water temperatures peak. At these increased temperatures, oxygen solubility is decreased, fish are more easily fatigued, and a caught fish is less likely to recover if it were to be released. Thus, this closure would allow a greater protection to reef fish during a time when they are already stressed by environmental extremes.

As anchoring is prohibited under this alternative, additional mooring buoys would be added over time as needed to disperse visitor use and improve the safety of scuba diving operations.

The special recreation zone would allow the lampara net commercial fishery for ballyhoo because this fishery does not physically impact coral reef habitat although there might be temporary noise impacts on reef organisms. Furthermore there are only a small number of commercial fishers who fish this area and they have limited ability to relocate.

The FWC would not participate in the research, monitoring, or rule development process associated with this alternative. All regulatory changes required under this alternative would be implemented via federal special regulation.

THE KEYS

Boca Chita Key

The northern portion of Boca Chita Key, including the day use area, campground, and boat basin, would be part of the visitor services / park administration zone. The management and use of the existing facilities in this northern portion of the key would remain as described in alternative 2. There would be no new construction. The southern portion of Boca Chita Key would be managed according to the multiuse zone. The private use of some visitor facilities via a park-issued special use permit would continue.

Elliott Key

Only the Elliott Key Harbor area would be included in the visitor services / park administration zone. The remainder would be in the multiuse zone (land). Elliott Key would continue to be open to visitors to dock (both day use and overnight docking / boat camping), picnic, hike, camp, access restrooms, and obtain potable water, as described in alternatives 1, 2, and 3.

Current visitor services and park administration facilities would continue to be used, but the specific uses of these facilities could change to improve efficiency, including opening a small visitor contact station in the multiuse building that currently houses the environmental education program. The park would continue to use Elliott Key as the main location for its environmental education program and to use Adams Key as a back-up location.

A staging area for paddlecraft could be built on the Elliott Key developed area, allowing visitors to be shuttled by motorboat to the key and depart from there to explore the island shorelines. The Breezeway Loop Trail and boardwalk would be made universally accessible. The ranger residences would remain.

Adams Key

Only the southern portion of Adams Key that includes the dock, day use / park administration area, pavilion, restrooms, and the two ranger residences would be part of the visitor services / park administration zone. Existing facilities and uses would continue as described in alternative 1. A staging area for paddlecraft might be built at the Adams Key developed area, allowing visitors to explore the island shorelines.

In this alternative, the park could move the environmental education program to Adams Key. Additional facilities may need to be built or rehabilitated, and appropriate environmental planning would occur before construction.

The northern portion of this key would be in the multiuse zone and managed accordingly.

Porgy Key

Only the northern portion of Porgy Key would be placed in the visitor services / park administration zone. The ruins from the old Jones homesite would be maintained and interpreted on-site. A dock for paddlecraft would be established.

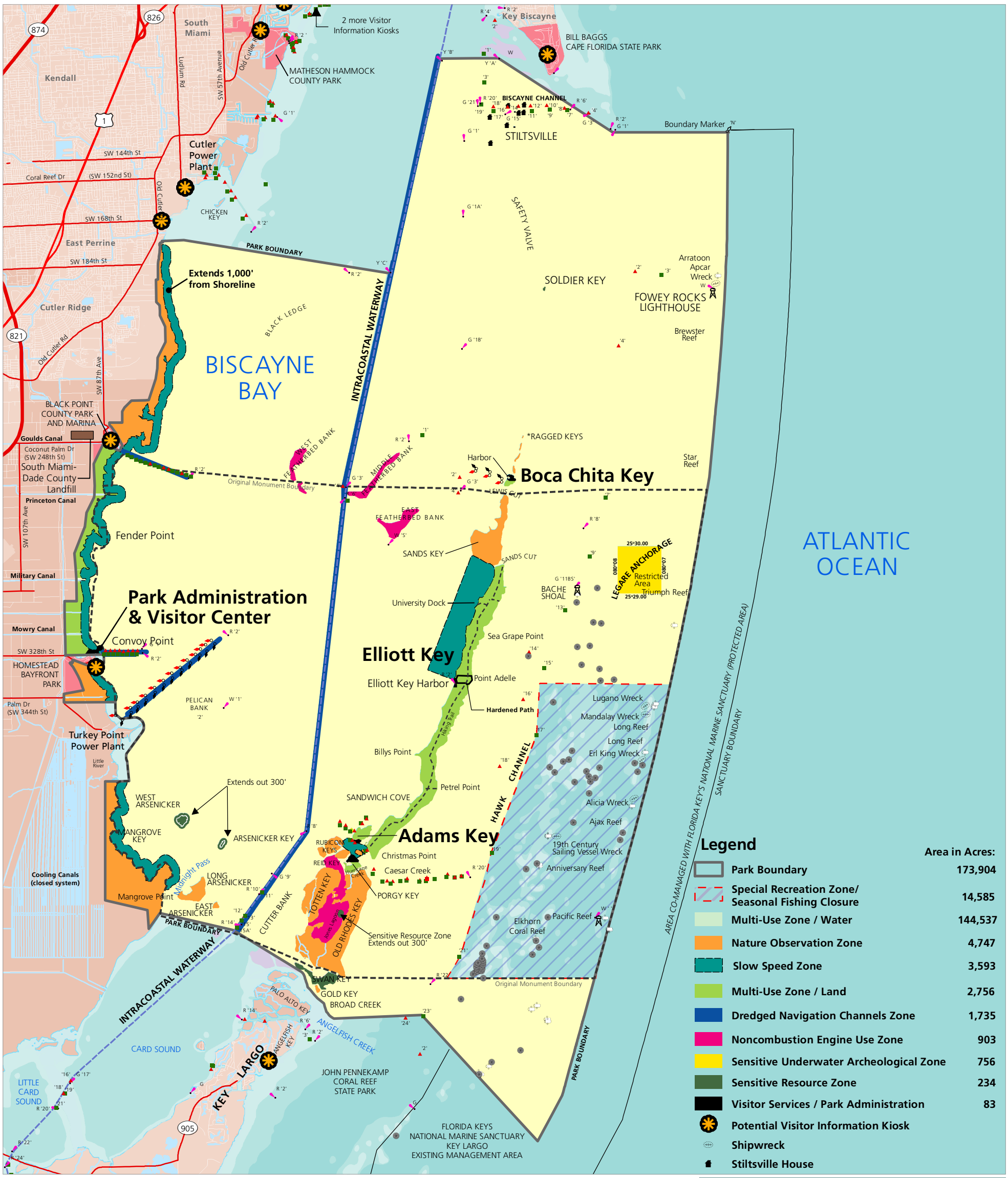
The southern portion of the key would be in the multiuse zone and would be managed as described in the multiuse zone in this alternative.

Other Keys

Several keys would be included in the nature observation zone—the Ragged Keys, Sands Key, Rubicon Keys, Reid Key, Old Rhodes Key, Totten Key, Gold Key, East Arsenicker Key, Long Arsenicker Key, and Mangrove Key.

West Arsenicker Key, Arsenicker Key, the water extending out 300 feet from these keys, as well as Swan Key and Soldier Key would be included in the sensitive resource zone (and marked by dayboards or buoys) to accommodate motorboat use in a greater area around the currently closed islands, while protecting the sensitive resource that is consistent with the best available science. While access to the general public would be prohibited, scientific research would continue to be allowed following NPS research permitting procedures.

At Jones Lagoon, the noncombustion engine use zone provides boater access and ease of navigation in the creeks of the area. The sensitive resource zone would extend for 300 feet around the small keys to protect the wading bird colonies in Jones Lagoon.



N W E S

BISCAYNE N.P.

0 1 2 Kilometers

0 1 2 Statute Miles

0 1 2 Nautical Miles

Map not for navigation

The NPS makes no warranty, express or implied, related to the accuracy or content of this map.

Note 1: Existing conditions and some features such as the locations of shoals, reefs, and shallow coral areas, may be considered unchanged.

Note 2: To show visually, the size of zone colors have been enlarged in certain areas.

Note 3: Some areas in the Park Boundary are not NPS owned but do not appear at this map scale. Zoning shown would not apply to non NPS lands unless they were acquired from a willing seller.

Map Key to Water Features and Landmarks

Water Depths: 0-6 feet (0-1.8 meters); 6-12 feet (1.8-3.6 meters); Over 12 feet (Over 3.6 meters)

Shallows and Reefs: Shoal or spoil area; Coral reef near water surface; Coral reefs also lie deeper below water surface.

Aids to Navigation (entering from seaward): Red — Port side lateral marks (even numbered); Other buoy. Green — Starboard side lateral marks (odd numbered); Daymarker.

Other Aids and Landmarks: Light; Danger Shoal; Tower; Mooring buoy

Light color: R Red, G Green, W White, Y Yellow

*RAGGED KEYS #2, #3, and #5 are Private Properties

Alternative 7

Biscayne National Park

United States Department of the Interior - National Park Service

DSC / October 2013 - Modified April 2015 / 169 - 20059

ALTERNATIVE 8: FINAL NPS PREFERRED ALTERNATIVE

CONCEPT

This alternative is a hybrid of alternatives 4 and 6. It includes the "no fishing" marine reserve zone from alternative 4, together with the other management zones described in alternative 6.

Alternative 8 would emphasize strong natural and cultural resource protection while providing a diversity of visitor experiences. Visitor opportunities in this alternative would range from the challenges of exploring the natural environment alone to the convenience of built surroundings. A limited amount of resource impacts would be tolerated in high-use areas of the park. Some visitor activities would be restricted in certain areas to protect sensitive resources and allow wildlife a respite from human contact. Other areas, such as Legare Anchorage, would be reserved for limited types of visitor use.

This alternative includes a marine reserve zone where fishing is prohibited. The purpose of the marine reserve zone is to provide visitors with the opportunity to experience a healthy, natural coral reef, with larger and more numerous tropical reef fish and an ecologically intact reef system. Recreational fishing opportunities would continue to be available in the majority of park waters, including the approximately 70% of park coral reef areas, or 63% of park hardbottom habitats, which would be outside the marine reserve zone.

Taking action under alternative 8 to protect reefs from other pressures such as overfishing, physical damage from fishing gear, anchoring, and vessel groundings; might also increase reef resiliency, potentially delaying the effects of global-scale stressors such as climate change, ocean acidification, and land-based sources of pollution (Jackson 2014).

The park would continue to seek opportunities to enhance the sustainability of facilities parkwide.

The discussion of actions common to all alternatives, such as Stiltsville, Ragged Keys, and Black Point Jetty, are a part of this alternative.

THE MAINLAND

Convoy Point would be in the visitor services / park administration zone and remain the park's primary administrative and visitor services area on the mainland, as described in alternative 1. If additional administrative space were needed, some functions would be expanded on-site while an alternate location in the local community would be studied for moving other functions and facilities.

A boardwalk and viewing platform could be built near Convoy Point to interpret the dwarf mangrove and marsh ecosystems. Site-specific environmental planning would be conducted before constructing the boardwalk. The visitor center boardwalk could be improved to enhance visitor safety and access. The jetties and associated trails at Convoy Point and Black Point could also be improved for enhanced visitor safety and access.

The mainland area between Convoy Point and Black Point County Park would be zoned multiuse, totaling 2,756 acres of land, and the remainder would be a nature observation zone, totaling 4,747 acres of land.

The Miami area hosts millions of tourists annually. The National Park Service would like to provide outreach to engage these potential visitors. However, the current National Park Service capital investment strategy does not support construction of new visitor center facilities. The National Park Service is consulting with the City of Miami to

provide visitor contact opportunities in the Dinner Key area. The National Park Service is also pursuing concession opportunities, including in the Dinner Key area, to expand on those previously offered in Convoy Point. No new NPS facilities would be built to support concession services.

BAY AND OCEAN WATERS

The multiuse zone would be applied to most of the park's water acreage (see alternative 8 map). Visitors could engage in a wide variety of activities such as sightseeing, boating, fishing, scuba diving, snorkeling, swimming, paddling, hiking, picnicking, camping, and visiting shipwrecks. The multiuse zone includes 148,358 acres of water, which is 85% of park waters.

There would be two slow speed zones (minimum wake) in this alternative. The first one would be parallel to the park's mainland shoreline extending out 1,000 feet from the park's northern boundary to the north end of Midnight Pass near the park's southern boundary. This would eliminate the need for two sets of navigation markers that would have been needed to delineate both a slow speed zone and noncombustion engine use zone as proposed in alternative 4, lessen the chance of boater confusion, and maintain boater access while still providing protection for the mangrove nursery habitat for important reef fish, Florida manatees, and safety for recreational paddlers. This zone was developed in consultation with the FWC and would be consistent with the *Florida Manatee Recovery Plan* (USFWS 2001), and the *Dade County Manatee Protection Plan* (DERM 1996). Midnight Pass would remain open and part of the multiuse zone.

The second area would be along Caesar Creek, south of Adams Key to Porgy Key, including the navigational channel between markers 20 to 24, same as alternative 4. The slow speed zone includes a total of 2,435 acres, or less than 2% of park waters.

There would be an idle speed zone (no wake) along the bayside of Elliott Key beginning at Sands Key and extending south to Elliott Key Harbor. The name of this zone was changed from slow speed as proposed in alternatives 6 and 7 to idle speed to be consistent with the state of Florida and Miami-Dade County naming convention and definition and to maintain the park's original intent of protecting human safety in the area.

Two shallow-water areas of the park would be included in the noncombustion engine use zone in alternative 8. This zone includes the waters around the park's southern keys including the bay side of Old Rhodes and Totten Keys, and near portions of Rubicon, Reid, Porgy, and Swan Keys. It would also include West, Middle, and East Featherbed Banks. Boats equipped with combustion engines could be used when propelled by push-pole or electric trolling motor, with outboard engine tilted up. The noncombustion engine use zone totals 903 acres, or less than 1% of the park.

Legare Anchorage

In this alternative, Legare Anchorage would be reduced to about 1 square mile and included in the sensitive underwater archeological zone to continue protecting underwater cultural resources. To facilitate protection and make it easier for boaters to identify, the area would be delineated by latitude and longitude lines and marked by dayboards or signs. Travel through the area in a vessel would be allowed, but drifting, mooring, anchoring, and entering the water would not. The use of underwater viewing devices would not be allowed. Recreational hook-and-line fishing would be allowed while trolling. Commercial fishing and trapping would not be allowed. This area could be used for permitted research activities.

Marine Reserve Zone

The management objective for the marine reserve zone would be to provide swimmers, snorkelers, scuba divers, and those who ride a glass-bottom boat the opportunity to experience a healthy, natural coral reef with larger and more numerous tropical reef fish and an ecologically intact reef system.

A marine reserve is a no-fishing area that functions as a long-term management approach, which improves the size and quantity of fish and provides habitat and ecosystem protection and preservation (Bohnsack 1994; Bohnsack and Ault 1996; Halpern 2003; Lester et al. 2009).

Scientific data indicate that no-take zones are more effective at reducing mortality—especially for reef species—than other methodologies, including catch and release, slot limits, etc. For example, the National Park Service, State of Florida, and other entities engaged in a scientific evaluation of the Dry Tortugas National Park Research Natural Area, a no-take reserve. In 2012, they found that sizes of red grouper, mutton snapper, yellowtail snapper, and hogfish increased since the implementation of the research natural area. In contrast, abundance and size of these species either remained the same or decreased in nearby areas of the Tortugas region that are open to fishing. Abundance of adult spawning-sized fish also increased within the research natural area, relative to other areas, contributing to reproduction and vitality of regional reef fish populations in South Florida (South Florida Natural Research Center et al. 2012). A recent study found similar increases in size and abundance in marine reserves in the Tortugas Region, including the research natural area, which indicates the merits of marine reserves for the exploited species of red grouper, black grouper, mutton snapper, yellowtail snapper, and hogfish. An added benefit of the reserves in this region was the spillover effect, in which areas surrounding the reserves exhibited larger fish populations, both in size and density (Ault et al. 2013).

Experience with marine reserves in Florida and elsewhere indicate that a well-designed marine reserve zone is a scientifically valid approach to restoring fish populations and would likely enable visitors to experience larger and more numerous fish at Biscayne National Park.

The park's reefs face a number of serious threats that the National Park Service has no authority to either regulate or manage, including ocean acidification and other effects of climate change, physical damage from derelict fishing gear, and pollution. The National Park Service anticipates that establishing a marine reserve zone would give park reefs the greatest opportunity for reef ecosystem recovery in order to be resilient to these external threats (Jackson 2014).

The marine reserve zone would provide important research opportunities to monitor the difference in reef ecosystem health and visitor experience compared to areas where fishing occurs (see appendix E for more information on the marine reserve zone).

The marine reserve zone would allow visitors the opportunity to participate in reef activities such as boating, snorkeling, scuba diving, underwater photography, and nature viewing. Boats would have easy access via Caesar Creek and Hawk Channel. Anchoring would be allowed to continue in this zone until mooring buoys are phased in. Recreational and commercial fishing would be prohibited in this zone to encourage long-term protection of the reef ecosystem. Opportunities for spearfishing lionfish or other invasive species identified by the park would continue in this zone, consistent with the *Fishery Management Plan*. For more information on the *Fishery Management Plan*, please visit http://www.nps.gov/bisc/parkmgmt/fishery-management-plan.htm.

In 2009, the park held three public workshops to share possible criteria for determining the size, shape, and location of a marine reserve zone and asked the public to draw possible zones on park maps. These public-proposed

maps were then analyzed by marine scientists from universities, NOAA Fisheries, and the National Park Service and ranked in order of effectiveness of reaching zone goals. The National Park Service then used an interdisciplinary team to propose the final zone size, shape, and location based on the scientists' rankings of the public-proposed zones. See appendix E for more details on the criteria and process.

This zone is the same size, shape, and location as presented in alternative 4. The marine reserve zone would be between Hawk Channel and the park's eastern boundary, extending from Pacific Reef north to Long Reef (10,502 acres). The proposed marine reserve zone would be about 6% of the waters of the park, and about 37% of the park's hardbottom communities, where corals grow or could be established; much of the park's hardbottom communities (63%) would be outside the zone and available for fishing. This zone would be within the boundaries of the original monument, in which the National Park Service has the authority to change fishing regulations after consulting with the state, as described in chapter 1. The coral reef protected in this zone would contribute toward the Coral Reef Task Force goal of 20% of the reefs in Florida being included in marine reserves (U.S. Coral Reef Task Force 2000).

THE KEYS

Boca Chita Key

The northern portion of Boca Chita Key, including the day use area, campground, and boat basin, would be part of the visitor services / park administration zone. The management and use of the existing facilities in this northern portion of the key would remain as described in alternative 2. There would be no new construction. The southern portion of Boca Chita Key would be managed according to the multiuse zone.

The private use of some visitor facilities via a park-issued special use permit would continue.

Elliott Key

Only the Elliott Key Harbor area would be included in the visitor services / park administration zone. The remainder would be in the multiuse zone (land). Elliott Key would continue to be open to visitors to dock (both day use and overnight docking / boat camping), picnic, hike, camp, access restrooms, and obtain potable water, as described in alternative 1.

Current visitor services and park administration facilities would continue to be used, but the specific uses of these facilities could change to improve efficiency, including opening a small visitor contact station in the multiuse building that currently houses the environmental education program. The park would continue to use Elliott Key as the main location for its environmental education program and to use Adams Key as a back-up location.

A staging area for paddlecraft could be built on the Elliott Key developed area, allowing visitors to be shuttled by motorboat to the key and depart from there to explore the island shorelines.

The Breezeway Loop Trail and boardwalk would be made universally accessible. The ranger residences would remain.

Adams Key

Only the southern portion of Adams Key that includes the dock, day use / park administration area, pavilion, restrooms, and the two ranger residences would be part of the visitor services / park administration zone. Existing facilities and uses would continue as described in alternative 1. A staging area for paddlecraft might be built at the Adams Key

developed area, allowing visitors to explore the island shorelines.

In this alternative, the park could move the environmental education program to Adams Key. Additional facilities may need to be built or rehabilitated, and appropriate environmental planning would occur before construction.

The northern portion of this key would be in the multiuse zone and managed accordingly.

Porgy Key

Only the northern portion of Porgy Key would be placed in the visitor services park administration zone. The ruins from the old Jones homesite would be maintained and interpreted on-site. A dock for paddlecraft would be established.

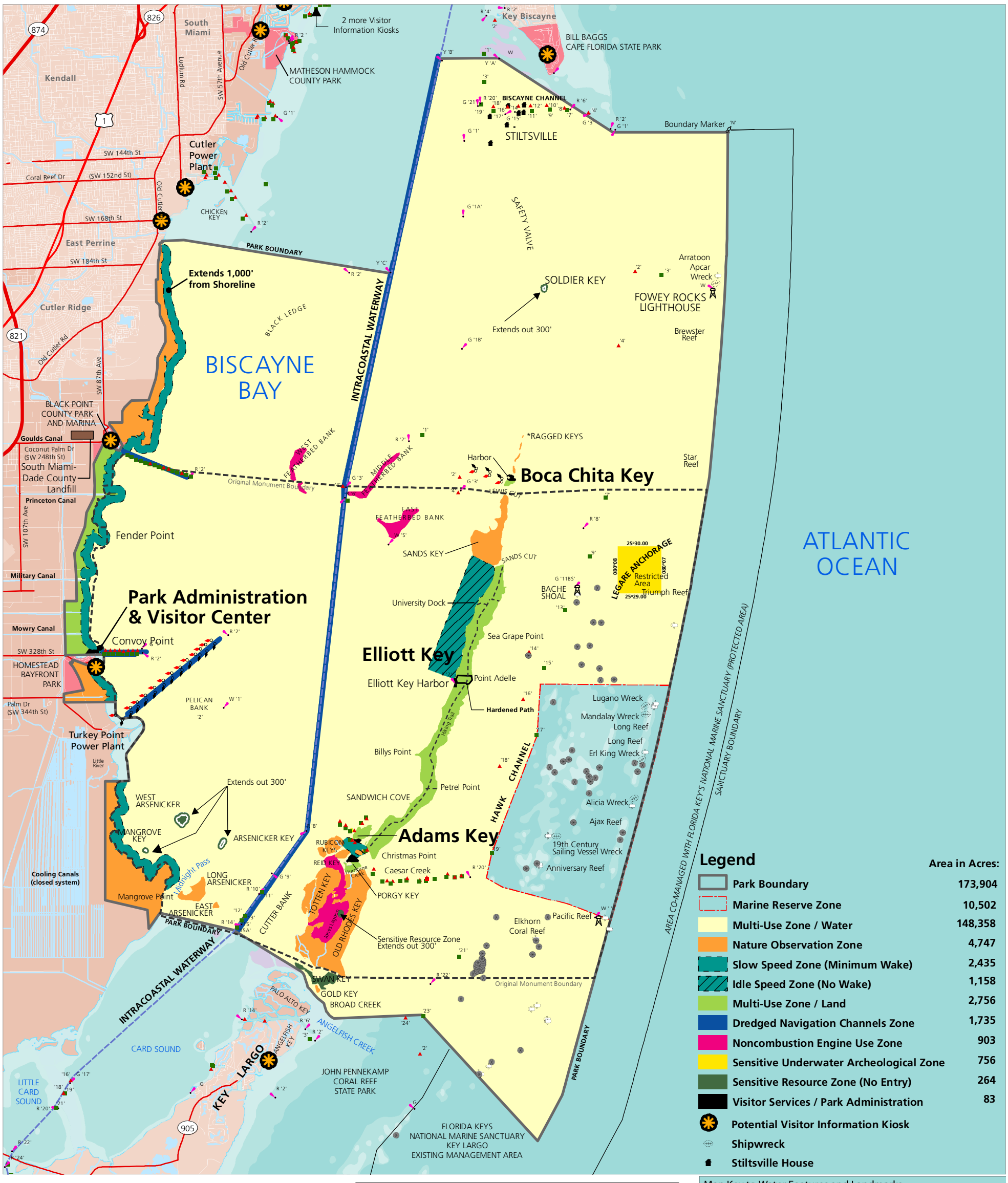
The southern portion of the key would be in the multiuse zone and would be managed as described in the multiuse zone in this alternative.

Other Keys

Several keys would be included in the nature observation zone—Ragged Keys, Sands Key, Rubicon Keys, Reid Key, Old Rhodes Key, Totten Key, Gold Key, East Arsenicker Key, Long Arsenicker Key, and Mangrove Key.

West Arsenicker Key, Arsenicker Key, Soldier Key, Mangrove Key, the water extending out 300 feet from these keys, as well as Swan Key would be included in the sensitive resource zone (a no entry zone that would be marked by dayboards or buoys) to accommodate motorboat use in a greater area around the currently closed islands while protecting the waterbird colonies, a sensitive resource. This setback distance is consistent with the best available science (Rodgers and Smith 1995) as well as *A Species Action Plan for Six Imperiled Wading Birds* (FWC 2014). While access to the general public would be prohibited, scientific research would continue to be allowed following NPS research permitting procedures.

At Jones Lagoon, the noncombustion engine use zone provides boater access and ease of navigation in the creeks of the area. The sensitive resource zone would extend for 300 feet around the small keys to protect the wading bird colonies in Jones Lagoon.



N W E S

BISCAYNE N.P.

0 1 2 Kilometers

0 1 2 Statute Miles

0 1 2 Nautical Miles

Map not for navigation

The NPS makes no warranty, express or implied, related to the accuracy or content of this map.

Note 1: Existing conditions and some features such as the locations of shoals, reefs, and shallow coral areas, may be considered unchanged.

Note 2: To show visually, the size of zone colors have been enlarged in certain areas.

Note 3: Some areas in the Park Boundary are not NPS owned but do not appear at this map scale. Zoning shown would not apply to non NPS lands unless they were acquired from a willing seller.

Map Key to Water Features and Landmarks

Water Depths: 0-6 feet (0-1.8 meters); 6-12 feet (1.8-3.6 meters); Over 12 feet (Over 3.6 meters)

Shallows and Reefs: Shoal or spoil area; Coral reef near water surface; Coral reefs also lie deeper below water surface.

Aids to Navigation (entering from seaward): Red — Port side lateral marks (even numbered); Green — Starboard side lateral marks (odd numbered); Other buoy; Daymarker

Other Aids and Landmarks: Light; Danger Shoal; Tower; Mooring buoy

Light color: R Red, G Green, W White, Y Yellow

*RAGGED KEYS #2, #3, and #5 are Private Properties

Alternative 8

Biscayne National Park

United States Department of the Interior - National Park Service

DSC / October 2013 - Modified April 2015/ 169 - 20059

ALTERNATIVES OR ACTIONS CONSIDERED BUT DISMISSED

Early discussion on alternative 5 included a large slow speed zone over the Safety Valve between Boca Chita Key and Stiltsville. Park staff expressed concerns that this area was not likely to be easily identified by the public or enforceable without increased costs for marking and maintenance. Although the Safety Valve is a shallow water area, it is generally deeper than other shallow areas of the park, such as West, Middle, and East Featherbed Banks or Pelican Bank. Additionally, this area is bisected by numerous deeper channels. As such, it is believed that it is probably better for boaters to maintain speeds high enough to plane their boats across the area because propeller damage is reduced. This is more protective of resources and may be safer for boaters so the slow speed zone was dropped from alternative 5.

Throughout the development of this document, representatives from the National Park Service, the FWC, and NOAA Fisheries considered several new zone possibilities to protect patch reefs in the southeast corner of the park to enhance fishery resources for a more enjoyable visitor experience that included both fishing and nonfishing opportunities. A number of management strategies (e.g., catch and release only, species-specific limits) associated with a new zone were considered to meet these objectives. In addition, different zone sizes, shapes, and locations, including smaller dispersed zones as exist in the Florida Keys National Marine Sanctuary and split marine reserve and special recreation zones, were also considered. Some of the reasons these concepts were ultimately dismissed from analysis included significant overlap with management actions already being addressed in the *Fishery Management Plan* (2014), lack of effectiveness at meeting the goal of the alternatives, and lack of feasibility for effective enforcement and regulation.

MITIGATION MEASURES COMMON TO ALL ACTION ALTERNATIVES

Congress charged the National Park Service with managing the lands under its stewardship "in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (NPS Organic Act, 54 USC 100301). As a result, the National Park Service routinely evaluates and implements mitigation whenever conditions occur that could adversely affect the sustainability of national park system resources.

To ensure that implementation of the action alternatives protects unimpaired natural and cultural resources and the quality of the visitor experience, a consistent set of mitigation measures would be applied to actions proposed in this plan. The National Park Service would prepare appropriate environmental review (i.e., those required by the National Environmental Policy Act, National Historic Preservation Act, Clean Water Act, and other relevant legislation) for these future actions. As part of the environmental review, the National Park Service would avoid, minimize, and mitigate adverse impacts when practicable. The implementation of a compliance monitoring program could be considered to stay within the parameters of NEPA and NHPA compliance documents, U.S. Army Corps of Engineers section 404 permits, etc. The compliance monitoring program would oversee these mitigation measures and would include reporting protocols.

The following mitigation measures and best management practices would be applied to avoid or minimize potential impacts from implementation of the alternatives. These measures would apply to all action alternatives.

NATURAL RESOURCES

Air Quality

The park would implement a dust abatement program as appropriate. Standard dust abatement measures could include the following elements—water sprinkling or otherwise stabilizing soils, covering haul trucks, employing speed limits on unpaved roads, minimizing vegetation clearing, and revegetating after construction.

Exotic Invasive Species

The park would implement a noxious weed abatement program as appropriate. Standard measures could include the following elements—ensure construction-related equipment arrives on-site free of mud or seed-bearing material, certify all seeds and straw material as weed-free, identify areas of noxious weeds before construction, treat noxious weeds or noxious weed topsoil before construction (e.g., topsoil segregation, storage, herbicide treatment), and revegetate with appropriate native species.

Nonnative wildlife that reside in Biscayne National Park include the lionfish, green iguana, cane toad, and Mexican red-bellied squirrel. Some species, such as the lionfish, are actively targeted for control (NPS 2012). Nonnative wildlife that prove to become invasive and problematic are managed on a case-by-case basis and the nature of the species involved and feasibility of its eradication or population control are considered.

Soils

The park would build new facilities on soils suitable for development and minimize soil

erosion by limiting the time that soil was left exposed and by applying other erosion control measures, such as erosion matting, silt fencing, and sedimentation basins in construction areas to reduce erosion, surface scouring, and discharge to water bodies. Areas would be revegetated with native plants in a timely manner once work was completed.

Special Status Species

Mitigation actions would occur during normal park operations as well as before, during, and after construction to minimize immediate and long-term impacts on rare, threatened, and endangered species. These actions would vary by the specific project and area of the park affected. Many of the measures listed below for vegetation and wildlife would also benefit rare, threatened, and endangered species by helping to preserve habitat. Mitigating actions specific to rare, threatened, and endangered species would include the following:

- Conduct surveys for rare, threatened, and endangered species as warranted.
- Site and design facilities/actions to avoid adverse effects on rare, threatened, and endangered species. If avoidance is infeasible, minimize and compensate adverse effects on rare, threatened, and endangered species as appropriate and in consultation with the appropriate resource agencies.
- Develop and implement restoration and/or monitoring plans as warranted. Plans should include methods for implementation, performance standards, monitoring criteria, and adaptive management techniques.
- Implement measures to reduce adverse effects of nonnative plants and wildlife on rare, threatened, and endangered species.
- To improve sea turtle nesting success and minimize disturbances to sea turtle nests from raccoon predators, the park could implement more intensive raccoon population control, particularly in campground areas where raccoons become abundant and problematic.
- Implement reasonable and prudent measures as outlined in the biological opinion issued by NOAA Fisheries in September 2012.

Vegetation

- Monitor areas used by visitors (e.g., trails) for signs of native vegetation disturbance. Use public education, revegetation of disturbed areas with native plants, erosion control measures, and barriers to control potential impacts on plants from trail erosion or social trailing (visitor-created trails).
- Develop revegetation plans for the disturbed area and require the use of native species. Revegetation plans should specify seed/plant source, seed/plant mixes, soil preparation, etc. Salvage vegetation should be used to the extent possible.
- The park will continue performing integrated pest management practices on nonnative and/or invasive plant species, as described in the Exotic Plant Management Plan.

Water Resources

- To prevent water pollution during construction, use erosion control measures, minimize discharge to water bodies, and regularly inspect construction equipment for leaks of petroleum and other chemicals.
- Build a runoff filtration system to minimize water pollution from larger parking areas.

- The park will continue using fuel spill prevention devices when fueling boats.

Wildlife

- Employ techniques to reduce impacts on wildlife, including visitor education programs, restrictions on visitor activities, and park ranger patrols.
- Implement a natural resource protection program. Standard measures would include construction scheduling, biological monitoring, erosion and sediment control, the use of fencing or other means to protect sensitive resources adjacent to construction, the removal of all food-related items or rubbish, wildlife-proof trash cans, removal of monofilament and other marine debris, and derelict trap removal and revegetation. This could include specific construction monitoring by resource specialists as well as treatment and reporting procedures.
- The U.S. Fish and Wildlife Service recommends that boating and nonmotorized recreation be limited inside a 330-foot buffer around bald eagle nest sites during nesting season (USFWS 2007). The park will use set-back distances for mixed-species colonies of nesting birds (such as egrets, herons, and ibises) as recommended by scientific literature. No limitations are necessary outside the nesting season.

Wetlands

- Delineate wetlands and apply protection measures during construction. Wetlands would be delineated by qualified NPS staff or certified wetland specialists and clearly marked before construction work. Perform construction activities in a cautious manner to prevent damage caused by equipment, erosion, siltation, etc. The National Park Service would apply for section 404 permits and conduct other site-specific environmental compliance for actions affecting wetlands.

CULTURAL RESOURCES

The National Park Service would preserve and protect, to the greatest extent possible, resources that reflect human occupation of Biscayne National Park. Specific mitigation measures include the following:

- Continue to develop inventories for and oversee research regarding archeological, historical, and ethnographic resources to better understand and manage the resources. Continue to manage cultural resources and collections following federal regulations and NPS guidelines.
- Subject projects to site-specific planning and compliance. Make efforts to avoid adverse impacts through the use of *The Secretary of the Interior's Standards for Archeology and Historic Preservation* and by using screening and/or sensitive design that would be compatible with historic resources. If adverse impacts could not be avoided, mitigate these impacts through a consultation process with all interested parties.
- Complete the section 106 review for each undertaking that may stem from the general management plan in accordance with the programmatic agreement among the National Park Service, the Advisory Council on Historic Preservation (ACHP), and the National Conference of State Historic Preservation Officers for compliance with section 106 of the National Historic Preservation Act (2008), and

section 106 implementing regulations, "Protection of Historic Properties" (36 CFR 800).

- Inventory all unsurveyed areas in the park for archeological, historical, and ethnographic resources as well as cultural and ethnographic landscapes. Conduct archeological surveys in unsurveyed areas where development would occur to determine the extent and significance of archeological resources in the areas.
- Document cultural and ethnographic landscapes in the park and identify treatments to ensure their preservation.
- Conduct archeological site monitoring and routine protection. Conduct data recovery excavations at archeological sites threatened with destruction where protection or site avoidance during design and construction is infeasible. Should archeological resources be discovered, stop work in that location until the resources were properly recorded by the National Park Service and evaluated under the eligibility criteria of the National Register of Historic Places. If, in consultation with the Florida state historic preservation office, the resources were determined eligible, implement appropriate measures either to avoid further resource impacts or to mitigate the loss or disturbance of the resources.
- Avoid or mitigate impacts on ethnographic resources that may be identified in the future through continuing consultation with American Indian tribes and other stakeholders.
- Conduct additional background research, resource inventory, and national register evaluation where information about the location and significance of cultural resources is lacking. Incorporate the results of these efforts into site-specific planning and compliance documents.
- Whenever possible, modify project design features to avoid effects on cultural resources. New developments would be relatively limited and would be located on sites that blend with cultural landscapes. If necessary, use vegetation screening as appropriate to minimize impacts on cultural landscapes.
- Strictly adhere to NPS standards and guidelines on the display and care of artifacts, including artifacts used in exhibits in the visitor center.

Soundscapes

The park would develop a park soundscape management plan to (1) establish soundscape standards for each management zone, (2) monitor park soundscape resources and sources of noise against those standards, and (3) implement an adaptive management program to ensure that soundscape standards are met.

Standard noise abatement measures would be followed during construction. Such measures could include the following:

- scheduling to minimize impacts on adjacent noise-sensitive resources
- using the best available noise control techniques wherever feasible
- using hydraulically or electrically powered tools when feasible rather than gasoline engine powered
- locating stationary noise sources as far from sensitive resources as possible

Park and visitor facilities and visitor services would be located and designed to minimize objectionable noise.

SUSTAINABLE DESIGN AND AESTHETICS

Projects would avoid or minimize adverse impacts on natural and cultural resources. Development projects (e.g., buildings, facilities, utilities, roads, bridges, and trails) or reconstruction projects (e.g., road reconstruction, building rehabilitation, and utility upgrade) would be designed to be in harmony with the surroundings, particularly in historic districts. Projects would reduce, minimize, or eliminate air and water nonpoint source pollution and would be sustainable whenever practicable by recycling and reusing materials, by minimizing materials and energy consumption during the project and throughout its lifespan.

FUTURE STUDIES AND PLANS NEEDED

PLANS

After completion and approval of a general management plan for managing Biscayne National Park, other more detailed studies and plans would be needed for implementation of specific actions. As required, additional environmental compliance (National Environmental Policy Act, National Historic Preservation Act, and other relevant laws and policies) and public involvement would be conducted. Those additional studies include but would not be limited to the following:

Cultural landscape reports would be prepared for potential landscapes at the Jones property and the Sweeting Homestead before any new development at these sites.

A **resource stewardship strategy** is now required for all park units. The resource stewardship strategy expands the desired resource conditions from this general management plan, describes the current condition of the resources, and identifies the difference between current and desired conditions. Comprehensive strategies to achieve and maintain the desired conditions are developed that identify specific monitoring indicators and targets. The resource stewardship strategy will guide the preparation of implementation plans such as a vegetation management plan.

A park **soundscape management plan** should be developed to (1) establish soundscape standards for each management zone in the park, (2) monitor park soundscape resources and sources of noise against those standards, and (3) implement an adaptive management program to ensure that soundscape standards are met.

Pending completion of the general management plan, the National Park Service will prepare a **long-range interpretation plan** for Biscayne National Park. This plan is a conceptual plan that will present a visitor experience vision for the national park based on purpose, significance, and the interpretive themes identified in this general management plan. The long-range plan will provide direction and focus to visitor experience in the park, and it will identify an action plan that best meets current and future visitor needs and effectively tells park stories. The plan will guide interpretation managers through elimination or modification of existing programs, creation of new programs, and determination of future media needs. The plan will also provide long- and short-range views and deal with all media, including personal services and facilities.

A **wilderness management plan** would be prepared to guide the preservation, management, and use of wilderness resources within the park. The wilderness management plan would identify future conditions, as well as establish indicators, standards, conditions, and thresholds beyond which management actions would be taken to reduce human impacts on wilderness resources.

OTHER FUTURE NEEDS

The National Park Service can close areas or otherwise regulate specific uses through special regulations published in 36 CFR when necessary for safety or resource protection. Possible implementation of a special recreation zone (and potential subsequent conversion to a marine reserve zone), marine reserve zone, and noncombustion engine use zone would restrict uses of these areas and so would require special regulations under 36 CFR 1.5b.

Regarding the marine reserve zone, as stipulated in 16 USC 410gg-2, the Secretary of

the Interior, after consultation with appropriate officials of the state, may designate species for which, areas and times within which, and methods by which fishing is prohibited, limited, or otherwise regulated in the interest of sound conservation to achieve the purposes for which Biscayne National Park was established. This provision is only applicable within the original monument boundaries, since expansion areas donated by the state must be in conformance with Florida state law. Since the proposed marine reserve zones described in alternatives 3, 4, and 5 and the special recreation zone described in alternatives 6 and 7 are all within the original monument, this plan and environmental impact statement is serving as the vehicle for consultation with the state, and upon finalization of a decision document, no further actions are necessary. In the signed memorandum of understanding (2002 / renewed 2007 for five years and 2012 for two years) with the National Park Service, the State of Florida recognizes that the park intends to consider the establishment of one or more marine reserves under its general management plan planning process for purposes other than sound park fishery resource management.

ESTIMATED COSTS

Cost estimates in general management plans are required by the 1978 Parks and Recreation Act and are requested by Congress. The purpose of cost estimates is to assist managers with setting priorities and to inform the public. For comparison purposes, the planning team estimated the cost to implement each of the alternatives (see table 3 at the end of this section).

Implementation of the approved plan, no matter which alternative, would depend on future NPS funding levels; servicewide priorities; and partnership funds, time, and effort. The approval of a general management plan does not guarantee that funding and staffing needed to implement the plan will be forthcoming. Full implementation of the plan could be many years in the future.

The following applies to costs presented in this plan:

- The cost figures shown here and throughout the plan are intended only to provide an estimate of relative costs of the alternatives and are not appropriate for budgeting purposes.
- The costs presented (in 2014 dollars) have been developed using NPS and industry standards to the extent available.
- Actual costs will be determined at a later date, considering the design of facilities and identification of detailed resource protection needs.
- Potential costs for land protection measures (easements, acquisitions, etc.) to implement any boundary adjustment proposals in this general management plan are not included in these estimates.
- The cost estimates represent the total costs of projects. Potential cost-sharing opportunities with partners could reduce the overall costs.
- Some proposals may not be funded within the life of this general management plan, and full implementation may occur many years into the future.

The NPS facility planning model was used to determine the needs for visitor service and administrative space.

ASSOCIATED COSTS: ALTERNATIVE 1 (NO ACTION)

Under the no-action alternative, future management would be a general continuation of what is being done now to provide visitor opportunities and to protect and preserve park resources. Costs associated with implementing this alternative are ongoing operations (base funding) and one-time projects that are already approved and funded. The total funding requested and approved for these projects in fiscal year 2015 is $217,000 in facility costs and $23,000 in nonfacility costs. This amount is included in the estimates for all alternatives. In addition to the above costs, periodic increases in base funding would be required to cover inflation and maintain the current level of park operations.

ASSOCIATED COSTS: ALTERNATIVE 2

Alternative 2 would emphasize the recreational use of the park while providing resource protection as governed by law, policy, and resource sensitivity. Cost estimates for this alternative include construction of new facilities and amenities at the following locations:

The Mainland

Convoy Point. Construction of a viewing platform in the area for better views of the bay. Build a boardwalk/loop trail with viewing platforms to interpret the dwarf mangrove forest and the mangrove shoreline north of the visitor center. Upgrade the jetty and boardwalk.

Miami Area. Construction of a new visitor center. A possible partnership with the City of Miami would reduce NPS costs.

The Keys

Boca Chita Key. Conversion of two structures used for park operations and visitor services. The number of kiosks providing interpretive information would be increased. The retaining wall on the north side of the island would be strengthened to maintain its current size, shape, and location.

Elliott Key. Make the hiking trail north from the harbor area to the Sweeting Homestead (3 miles) and south to Sandwich Cove (3 miles) universally accessible, and make Breezeway Loop Trail (0.5 mile) accessible. Primitive trails would be developed to connect the central trail to University Dock and to Sandwich Cove, Petrel Point, and the Sweeting Homestead. Also, primitive campsites would be established at the Petrel Point area, University Dock area, and Sandwich Cove. Toilets would be added at the new campsites and at University Dock, which would remain day use only. Visitor kiosks would be installed at the University Dock harbor. A paddlecraft launch area would be established. Adapt current environmental education facility for visitor services.

Adams Key. Provide new paddlecraft staging area and storage of paddlecraft at expanded dock, campsites, improved trails, and an environmental education venue.

Porgy Key. Stabilize and maintain the historic Jones homesite for interpretation and build a new docking area/ramp.

Nonfacility Costs

Nonfacility costs in this alternative would include cultural and natural resource management actions and funding for enhanced interpretive programs and materials throughout the park.

Personnel and equipment would be needed to implement the provisions of the marine reserve zone including buoy installation and maintenance, monitoring, and increased law enforcement patrol. Additional personnel and one-time costs would be needed to increase visitor understanding of the zones via personal interpretive services, exhibits, media, and publications.

Twenty additional full-time equivalent staff positions would be recommended to fully implement this alternative. This increase would be necessary to have staff available at external visitor contact facilities (6), other interpretive staff (5), for cultural resource management (2), natural resource management (2), law enforcement (3), administrative support (1), and additional maintenance work (1). Although the cost estimates were for full-time NPS employees, some work could be done by volunteers or cooperating association employees.

ASSOCIATED COSTS: ALTERNATIVE 3

Alternative 3 would allow all visitors a full range of experience opportunities throughout most of the park while providing strong natural and cultural resource protection. This alternative includes a marine reserve zone. Cost estimates for this alternative include construction of new facilities and amenities at the following locations:

The Mainland

Convoy Point. Same as alternative 2.

Miami Area. Same as alternative 2.

The Keys

Boca Chita Key. Same as alternative 2.

Elliott Key. Same as alternative 2, except the trail from the harbor south to Sandwich Cove and Petrel Point (3 miles) would be improved but not made fully accessible.

Adams Key. Same as alternative 2.

Porgy Key. Same as alternative 2.

Nonfacility Costs

Nonfacility costs in this alternative would include cultural and natural resource management actions and funding for enhanced interpretive programs and materials throughout the park.

Personnel and equipment would be needed to implement the provisions of the marine reserve zone including buoy installation and maintenance, monitoring, and increased law enforcement patrol. Additional personnel and one-time costs would be needed to increase visitor understanding of the zones via personal interpretive services, exhibits, media, and publications.

Nineteen additional full-time equivalent staff positions would be recommended to fully implement this alternative. This increase would be necessary to have staff available at the external visitor contact facilities (5), other interpretive staff (3), for cultural resources management (1), natural resource management (3), law enforcement (4), for additional maintenance work (2), and for administrative support (1). Although the costs were estimated for full-time NPS employees, some work could be done by volunteers or cooperating association employees.

ASSOCIATED COSTS: ALTERNATIVE 4

This alternative would emphasize strong natural and cultural resource protection while providing a diversity of visitor experiences and would tolerate a limited amount of resource impacts in high-use areas of the park. This alternative includes a marine reserve zone. Cost estimates for this alternative include construction of new facilities and amenities at the following locations:

The Mainland

Convoy Point. Upgrade jetty and boardwalk as in alternative 2. Consider developing a boardwalk or viewing platform to interpret the dwarf mangrove forest and the mangrove shoreline north of the visitor center.

Miami Area. Same as alternative 2.

The Keys

Boca Chita Key. Same as alternative 2.

Elliott Key. Make the Breezeway Loop Trail and boardwalk accessible.

Adams Key. Establish staging area for paddlecraft and develop minimal environmental education venue.

Porgy Key. Add a primitive dock; interpret the historic Jones homesite.

Nonfacility Costs

Nonfacility costs in this alternative would include cultural and natural resource management actions (including management of the marine reserve zone) and funding for

enhanced interpretive programs and materials throughout the park.

Fourteen additional full-time equivalent staff positions would be recommended to fully implement this alternative. This increase would provide necessary staff for the external visitor contact facilities (2), other interpretation (2), natural resource management (3), cultural resource management (1), law enforcement (3), and maintenance (3). Although the costs are estimated for full-time NPS employees, some work could be done by volunteers or cooperating association employees.

ASSOCIATED COSTS: ALTERNATIVE 5

Under alternative 5, the park would be managed to promote the protection of natural and cultural resources, including taking actions to optimize conditions for protection and restoration. This alternative includes a marine reserve zone. Cost estimates for this alternative include construction of new facilities and amenities at the following locations:

The Mainland

Convoy Point. Possibly upgrade jetty and boardwalk.

Miami Area. Same as alternative 2.

The Keys

Adams Key. May establish staging area for paddlecraft.

Nonfacility Costs

Nonfacility costs in this alternative would include cultural and natural resource management actions (including management of the marine reserve and access-by-permit zones) and funding for enhanced interpretation programs and materials throughout the park.

Personnel and equipment would be needed to implement the provisions of the marine reserve zone including buoy installation and maintenance, monitoring, and increased law enforcement patrols. Additional personnel and one-time costs would be needed to increase visitor understanding of the zones via personal interpretive services, exhibits, media, and publications.

Nineteen additional full-time equivalent staff positions would be recommended to fully implement this alternative. This increase would be necessary to have staff available for an external visitor contact facility (2), other interpretation (2), natural resource management (3), cultural resource management (1), law enforcement (6), maintenance (4), and administrative support (1). Two of the maintenance positions are for Fowey Rocks Lighthouse. Although the cost estimates are for full-time NPS employees, some work could be done by volunteers or cooperating association employees.

ASSOCIATED COSTS: ALTERNATIVE 6

This alternative would emphasize strong natural and cultural resource protection while providing a diversity of visitor experiences and would tolerate a limited amount of resource impacts in high-use areas of the park. This alternative includes a special recreation zone. Cost estimates for this alternative include construction of new facilities and amenities at the following locations:

The Mainland

Convoy Point. Same as alternative 4.

Miami Area. Same as alternative 2.

The Keys

Boca Chita Key. Same as alternative 2.

Elliott Key. Same as alternative 4.

Adams Key. Same as alternative 4.

Porgy Key. Same as alternative 4.

Nonfacility Costs

Nonfacility costs in this alternative would include cultural and natural resource management actions (including management of the marine reserve zone) and funding for enhanced interpretive programs and materials throughout the park.

Personnel and equipment would be needed to implement the provisions of the special recreation zone including buoy installation and maintenance, increased law enforcement patrols, and administration of fishing permits. It would also include additional resource management personnel to undertake the monitoring requirements described in the adaptive management strategy. Additional personnel and one-time costs would be needed to increase visitor understanding of the zones via personal interpretive services, exhibits, media, and publications.

Nineteen additional full-time equivalent staff positions would be recommended to fully implement this alternative. This increase would be necessary to have staff available at the external visitor contact facilities (2), other interpretive staff (2.5), for cultural resource management (1), natural resource management (1), law enforcement (4), for additional maintenance work (3.5), and for science plan management (5). Although the costs were estimated for full-time NPS employees, some work could be done by volunteers or cooperating association employees.

ASSOCIATED COSTS: ALTERNATIVE 7

This alternative is exactly the same as alternative 6, except for some details specific to the administration of the special recreation zone. Cost estimates for this alternative include construction of new facilities and amenities at the following locations:

The Mainland

Convoy Point. Same as alternative 4.

Miami Area. Same as alternative 2.

The Keys

Boca Chita Key. Same as alternative 2.

Elliott Key. Same as alternative 4.

Adams Key. Same as alternative 4.

Porgy Key. Same as alternative 4.

Nonfacility Costs

Nonfacility costs in this alternative would include cultural and natural resource management actions (including management of the marine reserve zone) and funding for enhanced interpretive programs and materials throughout the park.

Personnel and equipment would be needed to implement the provisions of the special recreation zone including buoy installation and maintenance as well as increased law enforcement patrol to enforce the seasonal fishing closure. It would also include

additional resource management personnel to undertake the monitoring requirements described in the adaptive management strategy. Additional personnel and one-time costs would be needed to increase visitor understanding of the zones via personal interpretive services, exhibits, media, and publications.

Nineteen additional full-time equivalent staff positions would be recommended to fully implement this alternative. This increase would be necessary to have staff available at the external visitor contact facilities (2), other interpretive staff (2), for cultural resources management (1), natural resource management (1), law enforcement (4.5), for additional maintenance work (3.5), and for science plan management (5). Although the costs were estimated for full-time NPS employees, some work could be done by volunteers or cooperating association employees.

ASSOCIATED COSTS: ALTERNATIVE 8: (FINAL NPS PREFERRED ALTERNATIVE)

This alternative would emphasize strong natural and cultural resource protection while providing a diversity of visitor experiences and would tolerate a limited amount of resource impacts in high-use areas of the park. This alternative includes a marine reserve zone. Cost estimates for this alternative include construction of the new facilities and amenities at the following locations:

The Mainland

Convoy Point. Same as alternative 4.

Miami Area. Same as alternative 1.

The Keys

Boca Chita Key. Same as alternative 2.

Elliott Key. Same as alternative 4.

Adams Key. Same as alternative 4.

Porgy Key. Same as alternative 4.

Nonfacility Costs

Similar to alternative 4.

Nonfacility costs in this alternative would include natural and cultural resource management actions (including management of the marine reserve zone) and funding for enhanced interpretive programs and materials for the park.

Personnel and equipment would be needed to implement the provisions of the marine reserve zone including buoy installation and maintenance as well as increased law enforcement patrols to enforce the seasonal fishing closure. It would also include additional resource management personnel to undertake monitoring requirements. Additional personnel and one-time costs would be needed to increase visitor understanding of the zones via personal interpretive services, exhibits, media, publications, and enhanced visitor contact opportunities in the Miami area and throughout the park.

Fourteen additional full-time equivalent staff positions would be recommended to fully implement this alternative. This increase would be necessary to have staff available at the external visitor contact facilities (2), other interpretive staff (1), for cultural resource management (1.5), natural resource management (2.5), law enforcement (3), and maintenance work (4). Although the costs were estimated for full-time NPS employees, some work could be done by volunteers or cooperating association employees.

TABLE 3. ESTIMATED COSTS OF THE ALTERNATIVES (IN 2014 DOLLARS)

	Alt 1 (no action)	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8 (preferred)
Recurring Costs								
Annual appropriated funding (FY 2012)	$4,211,000	$4,211,000	$4,211,000	$4,211,000	$4,211,000	$4,211,000	$4,211,000	$4,211,000
Additional Operational	$0	$1,732,000	$1,649,000	$1,152,000	$1,656,000	$1,828,000	$1,838,000	$1,238,000
Total	**$4,211,000**	**$5,942,000**	**$5,860,000**	**$5,363,000**	**$5,867,000**	**$6,039,000**	**$6,049,000**	**$5,449,000**
Additional Staffing (FTE[1])	0	+20	+19	+14	+19	+19	+19	+14
One-time Costs								
Facility Costs	$552,000	$6,189,000	$5,892,000	$1,181,000	$386,000	$1,181,000	$1,181,000	$1,181,000
Nonfacility Costs	$174,000	$660,000	$1,030,000	$1,004,000	$1,194,000	$1,298,000	$1,272,000	$1,104,000
Miami Area Visitor Center	N/A	$4,965,000	$4,965,000	$4,965,000	$4,965,000	$4,965,000	$4,965,000	$0
Total One-time Costs[2]	$726,000	$11,815,000	$11,887,000	$7,150,000	$6,546,000	$7,444,000	$7,418,000	$2,185,000

[1]The staffing figure (full-time equivalent) are the number of employees required to maintain the assets of the park at a stable level, provide acceptable visitor services, protect resources, and generally support park operations. This includes effort needed to operate the potential Miami area visitor center. The full-time equivalent number would not necessarily be NPS employees, instead full-time equivalent reflects the level of work needed. Park managers would explore opportunities to work with partners, volunteers, and other federal agencies to manage the park efficiently.

[2]Total one-time costs include nonfacility and facility costs including costs associated with a Miami-area visitor contact station. One-time facility costs include those for construction or renovation of facilities. In the no-action alternative, initial construction costs only include costs for projects that are already approved and funded. Nonfacility costs include the costs of actions for cultural and natural resource preservation and management, visitor service materials, and other park management activities that are not related to a facility but would require substantial funding above annual park operating costs.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

The National Park Service is required to identify the environmentally preferable alternative in its NEPA documents for public review and comment. The National Park Service, in accordance with Department of the Interior NEPA regulations (43 CFR 46) and CEQ's Forty Questions, defines the environmentally preferable alternative (or alternatives) as the alternative that best promotes the national environmental policy expressed in the National Environmental Policy Act (section 101[b]) (516 DM 4.10). The CEQ's Forty Questions (CEQ 1981) further clarifies the identification of the environmentally preferable alternative stating:

> *this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources (CEQ 40 Questions, Question 6a)*

Alternative 5 was selected as the environmentally preferable alternative because it is the alternative that would best protect the largest amount of park lands and waters and the most sensitive resources and habitats from the negative impacts of motorized boating, fishing, and marine debris. It also includes specific actions to enhance the preservation of important natural and cultural resources. Alternative 5 was previously identified in the 2011 Draft Plan and the 2013 Supplemental Plan as the environmentally preferable alternative, which remains unchanged.

CONSISTENCY WITH THE PURPOSES OF THE NATIONAL ENVIRONMENTAL POLICY ACT

The National Environmental Policy Act requires an analysis of how each alternative meets or achieves the purposes of the act (section 101[b]). Each alternative analyzed in a NEPA document must be assessed as to how it meets the following purposes:

1. fulfill the responsibilities of each generation as trustee of the environment for succeeding generations
2. ensure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings
3. attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences
4. preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice
5. achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities
6. enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources (42 USC 4331)

The Council on Environmental Quality has promulgated regulations for federal agencies' implementation of the National Environmental Policy Act (40 CFR 1500–1508). Section 1500.2 states that federal agencies shall, to the fullest extent possible, interpret and administer the policies, regulations, and public laws of the United States in accordance with the policies set forth in the act (sections 101[b] and 102[1]); therefore, other acts and NPS policies are referenced as applicable in the following discussion.

After the environmental consequences of the alternatives were analyzed, each alternative was evaluated as to how well the six goals would be met. The following discussion highlights how each alternative would meet or not meet these goals.

The alternatives do not differ much with respect to criteria 1 and 6; therefore, this evaluation focuses on criteria 2, 3, 4, and 5. Goal number 1 is satisfied by each of the alternatives because Biscayne is a national park and as the steward of these units, the National Park Service would continue to fulfill its mandate to protect the resources of Biscayne National Park and provide opportunities for enjoyment of those resources for future generations. Goal 6 addresses the quality of renewable resources and recycling depletable resources, which are not specifically addressed in this general management plan. However, conservation and recycling of resources is encouraged throughout the National Park Service and, therefore would be implemented under any alternative.

ALTERNATIVE 1: NO ACTION

Alternative 1 represents a continuation of the present course of park management. Under alternative 1, park staff would continue to respond to resource impacts, visitor demands, and facility maintenance needs as they arise according to existing management direction. Alternative 1 does not provide as much resource protection as the other alternatives—more resource impacts would be expected with increasing use levels in the no-action alternative. Without an updated general management plan, alternative 1 would lack the

range of diversity and individual choices found in the other alternatives; it also does not provide as much resource protection and active, beneficial management as the other alternatives. Thus, the no-action alternative would not meet goals 2, 3, 4, and 5 to the same extent as the other alternatives.

ALTERNATIVE 2

Alternative 2 would provide substantially more visitor use opportunities and access to the park, therefore fully meeting goals 2 and 5. However, there would be potentially more adverse impacts on the environment from increased park development in several locations, therefore, only partially meeting goals 3 and 4. Implementing user capacity and broader education programs under this alternative would contribute to meeting goals 2, 3, and 5. This alternative would continue protection of undeveloped areas of the park, but not to the extent of other alternatives, so goal 4 would be only partially met.

ALTERNATIVE 3

Alternative 3 would provide some additional visitor use opportunities and access to the park and some limitations in other areas to provide additional protection for sensitive natural and cultural resource areas, therefore, partially meeting goals 2 and 5. There would continue to be a potential for adverse impacts on the environment from increased park development in some locations, although less than alternative 2. Implementing user capacity and broader education programs under this alternative would contribute to meeting goals 2, 3, and 5. This alternative includes a marine reserve zone to provide a more enjoyable and diverse visitor experience, protect natural and cultural resources, and achieve the goal of a healthy coral reef ecosystem. And because the park's most significant cultural resources would be targeted for preservation efforts and the sensitive coral reef and reef patches in the southeast section of the park would be included in the marine reserve zone, alternative 2 meets purpose 4 to preserve historic, cultural, and natural aspects of our national heritage. The resource protection elements of this alternative would come at some cost to visitor opportunities and flexibility due to the access-by-permit zone and the marine reserve zone, so goals 3 and 5 would be only partially met. However, this alternative may also provide an enhanced visitor experience in these zones for some visitors because of diversified education and improved recreational opportunities in these areas.

ALTERNATIVE 4

Alternative 4 would offer some additional visitor use opportunities and access to the park and some limitations in other areas to provide additional protection for sensitive natural and cultural resource areas, therefore, partially meeting goals 2 and 5. There would also be less potential for adverse impacts on the environment from increased park development in some areas as compared to alternative 2. Implementing user capacity and broader education programs under this alternative would contribute to meeting goals 2, 3, and 5. This alternative includes a marine reserve zone to provide a more enjoyable and diverse visitor experience, protect the park's natural and cultural resources, and achieve the goal of a healthy coral reef ecosystem. Because the park's most significant cultural resources would be targeted for preservation efforts and the sensitive coral reef and reef patches in the southeast section of the park would be included in the marine reserve zone, alternative 4 meets purpose 4 to preserve important historic, cultural, and natural aspects of our national heritage. The resource protection elements of this alternative would come at some cost to visitor opportunities and flexibility due to the marine reserve zone, so goals 3 and 5 would be only partially met. However, this alternative may also provide an enhanced visitor experience in this zone for some visitors because of diversified education and improved recreational opportunities in this area.

ALTERNATIVE 5

Alternative 5 would support the highest level of resource protection and active, beneficial management of any of the alternatives. In this respect, alternative 5 provides greater overall limitations in other areas to provide additional protection for sensitive natural and cultural resource areas, therefore, partially meeting goals 2 and 5. Alternative 5 would provide the highest comparative level of protection of park resources based on the extent of the proposed marine reserve zone, so it would best meet goal 4. Implementing user capacity and other education programs under this alternative would contribute to meeting goals 2, 3, and 5. And because the park's most significant cultural resources would be targeted for preservation efforts and the sensitive coral reef and reef patches in the southeast section of the park would be protected under this alternative, it best meets purpose 4—to preserve important historic, cultural, and natural aspects of our national heritage of all alternatives. The resource protection elements of this alternative would come at some cost to visitor opportunities and flexibility, greater than any of the other alternatives, so goals 3 and 5 would be only partially met. However, this alternative may also provide an enhanced visitor experience in these zones for some visitors because of diversified education and improved recreational opportunities in these areas.

ALTERNATIVE 6

Alternative 6 would offer some additional visitor use opportunities and access to the park and some limitations in other areas to provide additional protection for sensitive natural and cultural resource areas, therefore, partially meeting goals 2 and 5. There would also be less potential for adverse impacts on the environment from increased park development in some locations as compared to alternative 2. Implementing user capacity and broader education programs under this alternative would contribute to meeting goals 2, 3 and 5. This alternative includes a larger sized special recreation zone designed to achieve many of the same goals as the marine reserve zone. And because the park's most significant cultural resources would be targeted for preservation efforts and the sensitive coral reef and reef patches in the southeast section of the park would be included in the special recreation zone, it meets purpose 4 to preserve important historic, cultural, and natural aspects of our natural heritage, although to a lesser degree than alternatives with a marine reserve zone. The resource protection elements of this alternative would come at some cost to visitor opportunities and flexibility due to the special recreation zone, so goals 3 and 5 would be only partially met. However, this alternative may also provide an enhanced visitor experience in this zone for some visitors because of diversified education and improved recreational opportunities in this area.

ALTERNATIVE 7

Alternative 7 would offer some additional visitor use opportunities and access to the park and some limitations in other areas to provide additional protection for sensitive natural and cultural resource areas, therefore partially meeting goals 2 and 5. There would also be less potential for adverse impacts on the environment from increased park development in some locations as compared to alternative 2. Implementing user capacity and broader education programs under this alternative would contribute to meeting goals 2, 3 and 5. This alternative includes a larger sized special recreation zone designed to achieve many of the same goals as the marine reserve zone. And because the park's most significant cultural resources would be targeted for preservation efforts and the sensitive coral reef and reef patches in the southeast section of the park would be included in the special recreation zone, it meets purpose 4 to preserve important historic, cultural, and natural aspects of our natural heritage, although to a lesser degree than alternatives with a marine reserve zone.

The resource protection elements of this alternative would come at some cost to visitor opportunities and flexibility due to the special recreation zone, so goals 3 and 5 would be only partially met. However, this alternative may also provide an enhanced visitor experience in this zone for some visitors because of diversified education and improved recreational opportunities in this area.

ALTERNATIVE 8: NPS PREFERRED ALTERNATIVE

Alternative 8 would offer some additional visitor use opportunities and access to the park and some limitations in other areas to provide additional protection for sensitive natural and cultural resource areas, therefore partially meeting goals 2 and 5. There would also be less potential for adverse impacts on the environment from increased park development in some locations as compared to alternative 2. Implementing user capacity and broader education programs under this alternative would contribute to meeting goals 2, 3 and 5. This alternative includes a marine reserve zone to provide a more enjoyable and diverse visitor experience, protect the park's natural and cultural resources, and achieve the goal of a healthier coral reef ecosystem. And because the park's most significant cultural resources would be targeted for preservation efforts and the sensitive coral reef and reef patches in the southeast section of the park would be included in the marine reserve zone, it meets purpose 4 to preserve important historic, cultural, and natural aspects of our natural heritage. The resource protection elements of this alternative would come at some cost to visitor opportunities and flexibility due to the marine reserve zone, so goals 3 and 5 would be only partially met. However, this alternative may also provide an enhanced visitor experience in this zone for some visitors because of diversified education and improved recreational opportunities in this area.

SUMMARY OF ALTERNATIVES AND IMPACTS

A series of tables follows as a quick reference to summarize the alternatives (table 4) as well as conclusions regarding impacts of each alternative (tables 5 and 6).

TABLE 4. SUMMARY OF ALTERNATIVES

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8
General Theme / Concept							
Alternative 1 (no action) would continue current management trends to provide visitor opportunities and preserve resources under current laws, policies, and plans. – Emphasize high level of access, with recreational opportunities throughout park. – Actively manage natural resources, activities for restoration, and recovery or maintenance of habitats and dependent species. – Continue cultural resources maintenance and monitoring.	Alternative 2 would emphasize the recreational use of the park while providing resource protection as governed by law, policy, and resource sensitivity. This concept would be accomplished by providing the highest level of services, facilities, and access to specific areas of the park of all the action alternatives. – Manage for a relatively high level of new or enhanced access, visitor services, and facilities at some locations. – Minimally modify natural resources for increased visitor access and development.	Alternative 3 would allow all visitors a full range of experience opportunities throughout most of the park and use a permit system to authorize a limited number of visitors to access some areas of the park. There would be limited access to other park areas to provide an uncrowded experience, and some areas would be closed to visitors to protect sensitive resources and allow wildlife a respite from human contact. – Add a relatively high level of new or enhanced access, visitor services, and facilities at some locations. – Relative to alternatives 1 and 2, provide additional opportunities to experience uncrowded areas and natural sounds. – Designate a marine reserve zone to provide swimmers, snorkelers, scuba divers, and those who ride glass-bottom boats the opportunity to experience a healthy, natural, and ecologically intact reef community.	Alternative 4 would emphasize strong natural and cultural resource protection while providing a diversity of visitor experiences. Some areas would be closed to visitors to protect sensitive resources and allow wildlife a respite from human contact. Other areas would be reserved for limited types of visitor use. – Provide moderate level of new or enhanced access, visitor services, and facilities. – Compared to alternatives 1, 2, and 3, increase opportunities to experience natural sounds. – Create a combination of noncombustion engine use and slow speed zones to provide high level of resource protection. – Designate a marine reserve zone to provide swimmers, snorkelers, scuba divers, and those who ride glass-bottom boats the opportunity to experience a healthy, natural, and ecologically intact reef community.	Alternative 5 would promote the protection of natural and cultural resources. This alternative would provide the highest level of resource protection while allowing the lowest level of visitor services of all the action alternatives. Visitor access and activities would be highly managed for resource protection while still enabling visitors to participate in a variety of activities. – Provide the highest level of opportunity to experience uncrowded areas and natural sounds of the action alternatives. –Provide the greatest resource protection of the action alternatives with the combination of noncombustion engine use and slow speed zones. – Designate the largest marine reserve zone (of the action alternatives) in the park to provide swimmers, snorkelers, scuba divers, and those who ride glass-bottom boats the opportunity to experience a healthy, natural, and ecologically intact reef community.	Alternative 6 would emphasize strong natural and cultural resource protection while providing a diversity of visitor experiences. Some areas would be closed to visitors to protect sensitive resources and allow wildlife a respite from human contact. Other areas would be reserved for limited types of visitor use. – Provide moderate level of new or enhanced access, visitor services, and facilities. – Compared to alternatives 1, 2, and 3, increase opportunities to experience natural sounds. – Create a combination of noncombustion engine use and slow speed zones to provide high level of resource protection. – Designate a special recreation zone where some types of fishing would be prohibited, recreational fishing would be by special permit, and snorkeling and scuba diving activities would be allowed.	Alternative 7 would emphasize strong natural and cultural resource protection while providing a diversity of visitor experiences. Some areas would be closed to visitors to protect sensitive resources and allow wildlife a respite from human contact. Other areas would be reserved for limited types of visitor use. – Provide moderate level of new or enhanced access, visitor services, and facilities. – Compared to alternatives 1, 2, and 3, increased opportunities to experience natural sounds. – Create a combination of noncombustion engine use and slow speed zones to provide high level of resource protection. – Designate a special recreation zone with same geography and size as alternative 6 where some types of fishing would be prohibited, recreational fishing would be closed June through September, and snorkeling and scuba diving activities would be allowed.	Alternative 8 would emphasize strong natural and cultural resource protection while providing a diversity of visitor experiences. Some areas would be closed to visitors to protect sensitive resources and allow wildlife a respite from human contact. Other areas would be reserved for limited types of visitor use. – Provide moderate level of new or enhanced access, visitor services, and facilities. – Compared to alternatives 1, 2, and 3, increased opportunities to experience natural sounds. – Create a combination of noncombustion engine use and slow speed zones to provide high level of resource protection. – Designate a marine reserve zone to provide swimmers, snorkelers, scuba divers, and those who ride glass-bottom boats the opportunity to experience a healthy, natural, and ecologically intact reef community.
Resource Management							
Mainland							
Maintain and restore the mangrove habitat and fresh and saltwater wetlands in their natural state.	Similar to alternative 1, with the addition of a nature observation zone.	Same as alternative 2.	Same as alternative 2.	Manage all of mainland as nature observation zone except zone encompassing visitor center and headquarters at Convoy Point.	Same as alternative 2.	Same as alternative 2.	Maintain and restore the mangrove habitat and fresh and saltwater wetlands in their natural state, with the addition of a nature observation zone.

TABLE 4. SUMMARY OF ALTERNATIVES

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8
Bay and Ocean							
– Keep existing three slower speed areas (2,059 acres) to protect manatee in two areas (along mainland shoreline; west of the north part of Elliott Key; and the area of Caesar Creek in front of the Adams Key dock). – Keep existing noncombustion engine use area in Jones Lagoon (439 acres). – Maintain Legare Anchorage for the protection of submerged cultural resources (2,014 acres). – Manage Fowey Rocks Lighthouse in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties* and complete repairs that will stabilize the structure, protect it from further deterioration, and potentially provide visitor access in the future.	– Designate four slow speed zones to increase visitor safety and protect shallow water habitat (2,305 acres). – Designate two noncombustion engine use zones to protect shallow water habitat and provide opportunities to be immersed in nature (2,875 acres). –Reduce size of Legare Anchorage while maintaining protection of submerged cultural resources (756 acres). – Manage Fowey Rocks Lighthouse the same as alternative 1.	– Designate four slow speed zones to increase visitor safety and protect shallow water habitat (2,265 acres). – Designate two noncombustion engine use zones to protect shallow water habitat and provide opportunities to be immersed in nature (2,968 acres). – Manage Legare Anchorage the same as alternative 2 (756 acres). – Manage Fowey Rocks Lighthouse the same as alternative 1. – Designate access-by-permit zone to limit damage to resources (5,192 acres). – Designate marine reserve zone between Hawk Channel and the park's eastern boundary, extending from Pacific Reef north to Long Reef and manage it for a healthy, natural coral reef with large and numerous tropical reef fish and an ecologically intact reef system (10,502 acres).	– Designate three slow speed zones to increase visitor safety and protect shallow water habitat (2,370 acres). – Designate four noncombustion engine use zones to protect shallow water habitat and provide opportunities to be immersed in nature (2,536 acres). – Manage Legare Anchorage the same as alternative 2 (756 acres). – Manage Fowey Rocks Lighthouse the same as alternative 1. – Designate marine reserve zone same as alternative 3 between Hawk Channel and the park's eastern boundary, extending from Pacific Reef north to Long Reef and manage it for healthy, natural coral reef with large and numerous tropical reef fish and an ecologically intact reef system (10, 502 acres).	– Designate three slow speed zones to increase visitor safety and protect shallow water habitat (3,684 acres). This would represent the largest area of protection by slow speed zones of all action alternatives. –Provide the highest level of protection for shallow water habitat of all action alternatives through four noncombustion engine use zones to protect shallow water habitat and provide opportunities to be immersed in nature (5,403 acres). – Manage Legare Anchorage the same as alternative 2 (756 acres). – Manage Fowey Rocks Lighthouse the same as alternative 1. – Designate largest access-by-permit zone of all action alternatives to limit damage to resources in the northwest part of the park,(10,081 acres). – Designate largest marine reserve zone of all action alternatives and manage it for healthy, natural coral reef with large and numerous tropical reef fish and an ecologically intact reef system (21,884 acres).	– Designate three slow speed zones to increase visitor safety and protect shallow water habitat (3,593 acres). – Designate two noncombustion engine use zones to protect shallow water habitat and provide opportunities to be immersed in nature (903 acres). –Manage Legare Anchorage the same as alternative 2 (756 acres). – Manage Fowey Rocks Lighthouse the same as alternative 1. – Designate a special recreation zone with recreational fishing by special permit to accommodate some recreational fishing while meeting the goal of providing a healthy coral reef ecosystem for a more enjoyable and diverse visitor experience(14,585 acres).	– Designate three slow speed zones to increase visitor safety and protect shallow water habitat (3,593 acres). – Designate four noncombustion engine use zones to protect shallow water habitat and provide opportunities to be immersed in nature (903 acres). – Manage Legare Anchorage the same as alternative 2 (756 acres). – Manage Fowey Rocks Lighthouse the same as alternative 1. – Designate a special recreation zone (same as alternative 6) where recreational fishing does not need a permit and is allowed for the months of June through September (14,585 acres).	– Designate three slow speed zones to increase visitor safety and protect shallow water habitat (3,593 acres. – Designate two noncombustion engine use zones to protect shallow water habitat and provide opportunities to be immersed in nature (903 acres). –Manage Legare Anchorage the same as alternative 2 (756 acres). – Manage Fowey Rocks Lighthouse in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties* and complete repairs that would stabilize the structure, protect it from further deterioration, and potentially provide visitor access in the future. – Designate marine reserve zone same as alternative 3 between Hawk Channel and the park's eastern boundary, extending from Pacific Reef north to Long Reef and manage it for healthy, natural coral reef with large and numerous tropical reef fish and an ecologically intact reef system (10,502 acres).
Keys							
– Continue to close four keys to visitation for protection of exceptional and sensitive resources—Arsenicker, West Arsenicker, Soldier, and Sands Keys.	– Close three keys to visitation for resource protection—Arsenicker, West Arsenicker, and Swan. – Provide higher level of historic structure reuse on Boca Chita Key than in alternative 1. – Manage southern cluster of keys and Sands and Ragged Keys to support sustainable, fully functioning, natural systems.	Same as alternative 2, but no additional campsites on Elliott Key and would not harden hiking trail.	– Close three keys as in alternative 2 for resource protection. – Manage Boca Chita, Elliott, Adams, and Porgy Keys for visitor access and recreation, except manage larger areas as multiuse zone to limit development compared to alternatives 1, 2, and 3. – Manage remaining park keys as in alternative 2.	– Close three keys as in alternative 2 and Totten and Sands Keys for resource protection. – Manage Boca Chita and Adams Keys as in alternative 4. – Manage majority of Elliott and Porgy Keys to support sustainable, fully functioning natural systems. – Manage southern cluster of keys and Soldier and Ragged Keys as in alternative 2.	– Close three keys as in alternative 2 and Soldier Key. – Manage Boca Chita, Elliott, Adams, and Porgy Keys as in alternative 4. – Designate sensitive resource zone around the small keys within Jones Lagoon to support sensitive habitat. – Manage remaining park keys as in alternative 2.	– Same as alternative 6.	– Close four keys to visitation for resource protection—Arsenicker, West Arsenicker, Swan, and Soldier Keys. – Provide higher level of historic structure reuse on Boca Chita Key than in alternative 1. – Manage southern cluster of keys and Sands and Ragged Keys to support sustainable, fully functioning natural systems. – Manage Boca Chita, Elliott, Adams, and Porgy Keys

TABLE 4. SUMMARY OF ALTERNATIVES

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8
							for visitor access and recreation, except manage larger areas as multiuse zone to limit development compared to alternatives 1, 2, and 3. – Designate sensitive resource zone around the small keys within Jones Lagoon to support sensitive habitat.
Visitor Experience							
Mainland							
Maintain current primary land-based area where visitors learn about the park and its resources and picnic, bird-watch, sightsee, and fish.	Similar to alternative 1 plus provide expanded opportunities to explore, sightsee, and experience natural sights and sounds in relatively remote surroundings along mangrove shoreline. Add a viewing platform and a boardwalk/loop trail with viewing platforms for interpreting the dwarf mangrove forest and mangrove shoreline. Increase visitor contact points throughout metropolitan Miami to engage potential visitors, including development of a new full-service NPS visitor center.	Same as alternative 2.	Same as alternative 2.	Provide highest level of opportunities (of the action alternatives) to experience natural sounds and sights in relatively remote surroundings along *all* of the shoreline. Maintain current primary land-based area where visitors learn about the park and its resources and picnic, bird-watch, sightsee, and fish, and possibly upgrade visitor center boardwalk and jetty. Increase visitor contact points throughout metropolitan Miami to engage potential visitors.	Same as alternative 2.	Same as alternative 2.	Provide expanded opportunities to explore, sightsee, and experience natural sights and sounds in relatively remote surroundings along mangrove shoreline. Possibly add a viewing platform and a boardwalk/ loop trail with viewing platforms for interpreting the dwarf mangrove forest and mangrove shoreline. Increase visitor contact points throughout metropolitan Miami to engage potential visitors, including development of expanded NPS concession services in the Dinner Key area.
Bay and Ocean							
– Keep park waters open to boats of varying sizes and power sources, with the exception of personal watercraft, and a variety of activities including scuba diving, camping, visiting shipwrecks, and recreational and commercial fishing. – Continue three slow speed zones for visitor safety. – Continue one noncombustion engine use zone. – Continue allowing visitors to drift fish, troll, and traverse Legare Anchorage but not to stop or enter the water.	– Keep a large percentage of park waters open to boats of varying sizes and power sources in multiuse zone (where visitors can experience wide range of activities in natural and cultural settings). – Include four slow speed zones. – Provide two noncombustion engine use zones for opportunities to experience a natural soundscape. – Reduce size of Legare Anchorage to increase boater access; visitors may travel	– Include large percentage of waters in multiuse zone. – Include four slow speed zones. – Similar to alternative 2, provide two noncombustion engine use zones for opportunities to experience natural a soundscape in those areas. – Manage two access-by-permit only zones for opportunities to experience areas with reduced congestion. – Manage Legare Anchorage the same as alternative 2. – Designate a marine reserve	– Include large percentage of waters in multiuse zone. – Include three slow speed zones. – Provide four noncombustion engine use zones for extensive opportunities to experience a natural soundscape. – Manage Legare Anchorage the same as alternative 2. – Designate a marine reserve zone: same as alternative 3.	– Include moderate percentage of park waters in multiuse zone of action alternatives. – Include three slow speed zones. Provides the largest area covered by slow speed zones of all action alternatives. – Provides highest area of noncombustion engine use zone areas for opportunities to experience natural a soundscape. – Provides largest area of access-by-permit zone area of all action alternatives for opportunities to experience	– Include large percentage of waters in multiuse zone. – Include three slow speed zones. – Provide two noncombustion engine use zones for extensive opportunities to experience a natural soundscape. – Manage Legare Anchorage the same as alternative 2. – Designate a special recreation zone with recreational fishing by special permit to accommodate some recreational fishing while meeting the goal of providing a healthy coral reef	– Include large percentage of waters in multiuse zone. – Include three slow speed zones: same as alternative 6. – Provide two noncombustion engine use zones: same as alternative 6. –Manage Legare Anchorage the same as alternative 2. – Designate a special recreation zone (same as alternative 6 where recreational fishing does not	– Include large percentage of waters in multiuse zone. – Include three slow speed zones. – Provide two noncombustion engine use zones for extensive opportunities to experience a natural soundscape. – Reduce size of Legare Anchorage, increase boater access; visitors may travel through area and fish by hook and line, but they cannot stop or enter water. Prohibit

TABLE 4. SUMMARY OF ALTERNATIVES

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8
Continue to allow commercial fishing under future special regulations, prohibit trapping.	through area and fish by hook and line, but they cannot stop or enter water. Prohibit commercial fishing and trapping.	zone to provide swimmers, snorkelers, scuba divers, and those who ride glass-bottom boats the opportunity to experience a healthy, natural coral reef and reduce visitor use conflicts.		reduced congestion areas. – Manage Legare Anchorage the same as alternative 2. – Designate largest marine reserve zone to improve visitor experience.	ecosystem for a more enjoyable and diverse visitor experience.	need a permit and is not allowed for the months of June through September).	commercial fishing and trapping. – Designate a marine reserve zone to provide swimmers, snorkelers, scuba divers, and those who ride glass-bottom boats the opportunity to experience a healthy, natural coral reef and reduce visitor use conflicts.
Keys							
– Maintain Boca Chita, Elliott, and Adams Keys as destination sites with some development (depending on key) for boaters who want to hike, picnic, camp, or sightsee. – Maintain relatively remote locations and self-directed activities on many remaining keys for visitor experience.	– Similar to alternative 1 for Boca Chita, Elliott, and Adams Keys, but with expanded opportunities (depending on key) for hiking, camping, paddling, and increased docking capacity. – Provide improved access to and interpretation of Jones homesite on Porgy Key. – Provide opportunities to experience natural sounds, sights, and systems in uncrowded, relatively remote surroundings on remaining park keys except Swan, West Arsenicker, and Arsenicker Keys.	– Similar to alternative 2, except Elliott Key Trail could be improved and there would be no additional campsites on Elliott Key.	– Reduce area of visitor services/park administration zone on Boca Chita, Elliott, Adams, and Porgy Keys compared to alternatives 2 and 3. – Enhance visitor safety in shallow waters around Elliott Key in slow speed zone. – Provide opportunities to experience natural sights and sounds in uncrowded relatively remote surroundings. – Other keys same as in alternative 2.	– Same as alternative 4 for Boca Chita and Adams Keys; eliminate visitor services/park administration zone on Porgy Key and discourage visitation at Jones homesite. Designate Elliott Key as a nature observation zone. – Allow visitors to experience natural sounds, sights, and systems in relatively remote surroundings on Porgy and Elliott Keys.	– Same as alternative 4 for Boca Chita, Adams, Porgy, and Elliott Keys. – Other keys similar to alternative 4 managed for sensitive resource zone, slow speed zone, and nature observation zone and reduced noncombustion engine use zone to provide opportunities to experience natural sights and sounds in uncrowded, relatively remote surroundings.	Same as alternative 6.	– Reduce area of visitor services/park administration zone on Boca Chita, Elliott, Adams, and Porgy Keys compared to alternatives 2 and 3. – Other keys similar to alternative 4 managed for sensitive resource zone, slow speed zone, and nature observation zone and reduced noncombustion engine use zone to provide opportunities to experience natural sights and sounds in uncrowded, relatively remote surroundings.
Facilities							
Mainland							
Maintain visitor services and infrastructure at or near current levels with the visitor center, designated paths, boardwalk, and jetty.	Add a viewing platform and a boardwalk/loop trail with viewing platforms for interpreting the dwarf mangrove forest and mangrove shoreline. Improve safety and accessibility of existing jetty and boardwalk, possibly with shade structures and benches.	Same as alternative 2.	Same as alternative 2.	Same as alternative 1.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2, except no visitor center building in Miami area. Add a viewing platform and a boardwalk/loop trail with viewing platforms for interpreting the dwarf mangrove forest and mangrove shoreline. Improve safety and accessibility of existing jetty and boardwalk, possibly with shade structures and benches.
Continue limited visitor contact facilities outside the park to provide contact information and signs at public sites.	Increase visitor contact points outside the park through kiosks, signs, possible educational programs, and NPS personnel established at marinas and state/local parks through partnerships.	Visitor contact points outside the park: same as alternative 2.	Visitor contact points outside the park: Same as alternative 2.	Visitor contact points outside the park: Same as alternative 2.	Visitor contact points outside the park: Same as alternative 2.	Visitor contact points outside the park: Same as alternative 2.	Increase visitor contact points outside the park through kiosks, signs, possible educational programs, and NPS personnel established at marinas and state/local parks through partnerships, without

TABLE 4. SUMMARY OF ALTERNATIVES

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8
							the addition of a new visitor center building in the Miami area.
			Keys				
– Maintain existing facilities on Boca Chita Key including dock, kiosks, harbor, historic structures, picnic areas, restrooms, primitive campground, and maintenance building. Possibly reuse some historic structures for park operations. –Maintain existing facilities on Elliott Key including dock, marina, trails, picnic and restroom facilities, environmental education center, maintenance facility, ranger station and residences. – Maintain existing facilities on Adams Key including dock, trail, day use picnic pavilion, restroom facilities, wayside exhibits, ranger residences, and maintenance facility. – Maintain existing facilities at Porgy Key including the remains of historic dock and Jones homesite without interpretation. – Manage Fowey Rocks Lighthouse in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties* and complete repairs that would stabilize the structure, protect it from further deterioration, and potentially provide visitor access in the future.	– Reuse more historic structures for park operations and visitor services on Boca Chita Key; add new docks; strengthen retaining wall on north side. – Improve existing/ establish new trails and enhance access on Elliott Key; establish new primitive campsites and visitor kiosks; establish paddlecraft launch; and possibly a food concession. Keep ranger residences; make Breezeway Loop Trail, boardwalk, and the central hiking trail accessible. – Build new staging area for paddlecraft on Adams Key, develop primitive campsites; improve trails, improve dock, possibly establish paddlecraft rentals, and possibly a campers/ convenience store and classroom facility. – Improve Jones homesite on Porgy Key. – Manage Fowey Rocks Lighthouse the same as alternative 1.	– Boca Chita: Same as alternative 2. – Elliott Key: Same as alternative 2, except establish primitive connecting trail to University Dock and improve central trail. – Adams Key: Same as alternative 2 except no primitive campsites. – Porgy Key: Same as alternative 2. – Manage Fowey Rocks Lighthouse the same as alternative 1.	– Continue to use day use facilities, campground, and boat basin on the northern section of Boca Chita Key; use some historic structures for park operations/visitor services. – Maintain existing harbor facilities and continue administrative and visitor services uses on Elliott Key, and open small visitor contact station. Make Breezeway Loop Trail and boardwalk accessible. – Build new staging area for paddlecraft on Adams Key; establish environmental education program with minimal facilities. – Build rustic dock to improve site for visitation on Porgy Key; stabilize Jones homesite and offer interpretation on-site. – Manage Fowey Rocks Lighthouse the same as alternative 1.	– Boca Chita Key: Same as alternative 4. – Elliott Key: Same as alternative 1, except a staging area for paddlecraft might be built. – Adams Key: Same as alternative 1. – Porgy Key: Same as alternative 1. – Manage Fowey Rocks Lighthouse the same as alternative 1.	Same as alternative 4.	Same as alternative 4.	– Continue day use facilities, campground, and boat basin on the northern section of Boca Chita Key; use some historic structures for park operations/ visitor services. – Maintain existing harbor facilities and continue administrative and visitor services uses on Elliott Key, and open small visitor contact station. Make Breezeway Loop Trail and boardwalk accessible. – Build new staging area for paddlecraft on Adams Key; establish environmental education program with minimal facilities. – Build rustic dock to improve site for visitation on Porgy Key; stabilize Jones homesite and offer interpretation on-site. – Manage Fowey Rocks Lighthouse the same as alternative 1.

TABLE 5. SUMMARY OF KEY IMPACTS OF IMPLEMENTING THE ALTERNATIVES

	ALTERNATIVE 1 — NO ACTION	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7	ALTERNATIVE 8
Impacts on Natural Resources								
Fishery Resources	Existing impacts on park fishery resources and fish habitat from boating and fishing would continue to be long term, minor to moderate, and adverse. No new adverse impacts from proposed management actions.	Some existing adverse impacts now occurring on park fishery resources and seagrass habitat for fish in the park would be reduced due to additions of slow-speed and noncombustion engine use zones, resulting in a long-term beneficial impact and continuation of a minor to moderate adverse impact. No new adverse impacts from proposed management actions.	Similar to alternative 2, some ongoing adverse impacts now occurring to park fishery resources and fish habitat in the park would be reduced, resulting in a long-term, beneficial impact overall primarily due to the marine reserve zone. No new adverse impacts from proposed management actions.	Similar to alternative 3 with additional protection around Featherbeds for fish habitat.	Some ongoing adverse impacts now occurring to park fishery resources and fish habitat in the park would be reduced, resulting in a long-term, beneficial impact overall. The benefits would be greater than alternative 3 due to the larger marine reserve zone. No new adverse impacts from proposed management actions.	Some ongoing adverse impacts now occurring to park fishery resources and fish habitat in the park would be reduced, resulting in a long-term, beneficial impact overall. However beneficial impacts would be less than alternative 4 because some fishing is still allowed in the special recreation zone. No new adverse impacts from proposed management actions.	Same as alternative 6. No new adverse impacts from proposed management actions.	Some ongoing adverse impacts now occurring to park fishery resources, and fish habitat in the park would be reduced, resulting in a long-term, beneficial impact overall primarily due to the marine reserve zone. Additional protection around Featherbeds for fish habitat. No new adverse impacts from proposed management actions.
Threatened & Endangered Species	Existing long-term, moderate adverse impacts on some species (sea turtles, smalltooth sawfish, and stony corals) would persist as a result of boating, fishing, and marine debris. Existing long-term, negligible, adverse impacts on some species (manatees, American crocodiles, red knot, and butterflies) would persist as a result of pre-existing habitat modifications and continued recreational use. Current management activities would continue to have a long-term, beneficial impact on nesting turtles and butterflies in the park. Existing slow speed zone along the mainland shoreline would continue to have a long-term beneficial impact on manatees. No new adverse impacts from proposed management actions.	Existing long-term, moderate, adverse impacts on some species (sea turtles, smalltooth sawfish, and stony corals) would persist as a result of recreational activities. Existing long-term, negligible adverse impacts on some species (manatees, American crocodiles, and butterflies) would persist. Long-term, beneficial impacts on manatees due to slow speed and noncombustion engine use zones. Proposed development that could have negligible to minor long-term, adverse impacts on American crocodiles, sea turtles, and butterflies. Most impacts would be mitigated.	Existing long-term, moderate adverse impacts on some species (sea turtles, smalltooth sawfish, and stony corals) would persist in most areas as a result of recreational activities. Existing long-term, negligible adverse impacts on some species (manatees, American crocodiles, and butterflies) would persist. Long-term, beneficial impacts on manatees due to slow speed and noncombustion engine use zones. Proposed development could have long-term, adverse, negligible to minor impacts on habitats used by American crocodiles, sea turtles, and butterflies. Most impacts would be mitigated. Long-term, beneficial impact to stony corals, sea turtles, and smalltooth sawfish in marine reserve zone.	Same as alternative 3.	Existing long-term, moderate adverse impacts on some species (sea turtles, smalltooth sawfish, and stony corals) would persist in some areas as a result of recreational activities. Existing long-term, negligible adverse impacts on some species (manatees, American crocodiles, and butterflies) would persist in some areas. Long-term, beneficial impact on manatees due to slow speed and noncombustion engine use zones. Long-term, beneficial impact to stony corals, sea turtles, and smalltooth sawfish in marine reserve zone. No new adverse impacts from proposed management actions.	Existing long-term, moderate adverse impacts on some species (sea turtles, smalltooth sawfish, and stony corals) would persist in some areas as a result of recreational activities. Existing long-term, negligible adverse impacts on some species (manatees, American crocodiles, and butterflies) would persist in some areas. Long-term, beneficial impact on manatees due to slow speed and noncombustion engine use zones. Proposed development could have long-term, adverse, negligible impacts on habitats used by American crocodiles, sea turtles, and butterflies, but most impacts would be mitigated. Long-term, beneficial impact to sea turtles, smalltooth sawfish, and stony corals in special recreation zone but to a lesser extent than in the marine reserve zone in alternatives 3, 4, and 5 due to continued fishing. There would be greater physical protection of stony corals due to exclusion of traps within the special recreation zone.	Same as alternative 6.	Existing long-term, moderate adverse impacts on some species (sea turtles, smalltooth sawfish, and stony corals) would persist in some areas as a result of recreational activities. Existing long-term, negligible adverse impacts on some species (manatees, American crocodiles, and butterflies) would persist in some areas. Long-term, beneficial impact on manatees due to slow speed and noncombustion engine use zones. Proposed development could have long-term, adverse, negligible impacts on habitats used by American crocodiles, sea turtles, and butterflies, but most impacts would be mitigated. Long-term, beneficial impact to sea turtles, smalltooth sawfish, and stony corals in marine reserve zone.

TABLE 5. SUMMARY OF KEY IMPACTS OF IMPLEMENTING THE ALTERNATIVES

	ALTERNATIVE 1 — NO ACTION	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7	ALTERNATIVE 8
Special Status Species	Continuation of long-term, negligible adverse impacts on some state listed bird species due to disturbance by park visitors. Existing closures on some sensitive resource areas would continue to have a long term beneficial impact on some state listed species. No new adverse impacts from proposed management actions.	Proposed development could result in long-term, minor, adverse impacts on various state listed species. There would be beneficial impacts to state listed birds due to the establishment of protective zones around some keys that contain waterbird colonies.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.	Similar to alternative 2. Impacts to birds would be negligible due to protective zoning.	Similar to alternative 2. Impacts to birds would be negligible due to protective zoning.	Similar to alternative 2. Impacts to migratory birds would be negligible due to nature observation zone buffer. Proposed development could result in long-term, negligible, adverse impacts on various state listed species. There would be beneficial impacts to state listed birds due to the establishment of protective zones around some keys that contain waterbird colonies.
Terrestrial Vegetation	Existing long-term, negligible to minor, adverse impacts on terrestrial vegetation in the park would continue as a result of visitor activities. No new adverse impacts from proposed management actions.	Long-term, localized, negligible to minor adverse impacts associated with minor construction projects and continued or increasing visitor use. Some construction-related adverse impacts would be mitigated through project design. There would be long-term, beneficial impacts to native vegetation because there would be no new development in the keys included in the nature observation zone.	Similar to alternative 2. Impacts to terrestrial vegetation would be less due to smaller footprint of trail improvements on Elliott Key.	Same as alternative 3.	Same as alternative 1 as there would be no trail improvements under this alternative.	Same as alternative 3.	Same as alternative 3.	Same as alternative 3. Long-term, localized, negligible to minor adverse impacts associated with minor construction projects and continued or increasing visitor use. Impacts to terrestrial vegetation would be less than alternative 2 due to smaller footprint of trail improvements on Elliott Key. Some construction-related adverse impacts would be mitigated through project design.
Wetlands	Existing long term, minor to moderate, adverse impacts would continue as a result of past land management actions. No new adverse impacts from proposed management actions.	Proposed development would have a long-term, minor, adverse impact on the wetlands along the mainland coast of the park, particularly the mangroves. Short-term impacts associated with construction would continue to be adverse but minor to moderate and localized. Long-term impacts would be mitigated through design and would be adverse but localized and minor.	Same as alternative 2.	Same as alternative 2.	Similar to alternative 2. Beneficial, long-term impacts to wetlands as a result of protective zoning.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2. Proposed development would have a long-term, minor, adverse impact on the wetlands along the mainland coast of the park, particularly the mangroves. Short-term impacts associated with construction would continue to be adverse but minor to moderate and localized. Long-term impacts would be mitigated through design and would be adverse but localized and minor.

TABLE 5. SUMMARY OF KEY IMPACTS OF IMPLEMENTING THE ALTERNATIVES

	ALTERNATIVE 1 — NO ACTION	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7	ALTERNATIVE 8
Submerged Aquatic Communities	Existing, minor to moderate, adverse impacts on submerged aquatic vegetation would continue as a result of boating, fishing, and marine debris. No new adverse impacts from proposed management actions.	Existing, minor to moderate, adverse impacts on submerged aquatic vegetation would continue as a result of boating, fishing, and marine debris in much of the park although impacts would be reduced within the slow speed and noncombustion engine use zones resulting in long-term beneficial impacts.	Similar to alternative 2. Benefits would be more than alternative 2 due to the establishment of the marine reserve zone and access-by-permit zone.	Similar to alternative 2. Benefits would be more than alternative 2 due to the establishment of the marine reserve zone.	Similar to alternative 3. Benefits would be greater due to the larger marine reserve zone.	Similar to alternative 3. Benefits would be less due to continued adverse ecological impact from allowing some fishing in the special recreation zone. Physical protection for this resource would be more due to exclusion of traps within the larger special recreation zone.	Same as alternative 6.	Same as alternative 4. Existing, minor to moderate, adverse impacts on submerged aquatic vegetation would continue as a result of boating, fishing, and marine debris in much of the park. Impacts would be reduced within the slow speed, noncombustion engine use, and marine reserve zones resulting in long-term beneficial impacts.
Soundscapes	Existing long-term, minor to moderate adverse impacts on natural soundscapes would continue as a result of persistent boat-related noise. Existing short-term, negligible, adverse impacts on natural soundscapes would continue as a result of routine park operations and maintenance activities as well as concentration of cars and visitors around some areas of the park. No new adverse impacts from proposed management actions.	Long-term beneficial impacts on soundscapes due to protective zoning. Short-term negligible to minor, adverse impacts during construction, existing minor to moderate adverse impacts on natural soundscapes would continue as a result of persistent boat-related noise in much of the park. Existing negligible, short-term adverse impacts on natural soundscapes would continue as a result of routine park operations and maintenance activities.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2. Long-term beneficial impacts on soundscapes due to protective zoning. Short-term negligible to minor, adverse impacts during construction, existing minor to moderate adverse impacts on natural soundscapes would continue as a result of persistent boat-related noise in much of the park. Existing negligible, short-term adverse impacts on natural soundscapes would continue as a result of routine park operations and maintenance activities.
Impacts on Cultural Resources								
Archeological Resources **(including submerged archeological sites)**	Localized, long-term to permanent, negligible to minor, adverse impacts on submerged and terrestrial archeological resources due to visitor use. Continued looting, depending on its severity, would be a minor adverse impact on submerged archeological resources. Beneficial impacts from ongoing survey and inventory efforts. No new adverse impacts from proposed management actions. For section 106 there would be no adverse effect.	Similar to alternative 1. Localized, long-term negligible to minor adverse impacts due to greater potential risk from expanded recreational use and increased visitor services, facilities, and access in some areas of the park. For section 106 there would be no adverse effect.	Similar to alternative 1. Beneficial impacts to submerged archeological sites in the marine reserve zone due to elimination of fishing gear and anchoring and reduction in marine debris. For section 106 there would be no adverse effect.	Same as alternative 3. For section 106 there would be no adverse effect.	Similar to alternative 3. Beneficial impacts expanded due to larger marine reserve zone that includes a greater number of submerged archeological sites. For section 106 there would be no adverse effect.	Similar to alternative 4. Beneficial impacts expanded due to larger special recreation zone that includes a greater number of submerged archeological sites. Adverse impacts from fishing gear would remain. For section 106 there would be no adverse effect.	Same as alternative 6. For section 106 there would be no adverse effect.	Similar to alternative 4. Localized, negligible to minor, adverse impacts to submerged archeological sites would continue until phase-out of anchoring is completed. For section 106 there would be no adverse effect.

TABLE 5. SUMMARY OF KEY IMPACTS OF IMPLEMENTING THE ALTERNATIVES

	ALTERNATIVE 1 — NO ACTION	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7	ALTERNATIVE 8
Historic Structures and Buildings	Localized, long-term, beneficial due preservation or rehabilitation undertakings and adaptive reuse of historic structures and buildings at Boca Chita Key, Fowey Rock Lighthouse, and the historic Jones homesite. Long-term negligible to minor adverse impacts due to natural deterioration, and wear and tear from visitor use. Beneficial impacts from ongoing survey and research efforts. No new adverse impacts from proposed management actions. For section 106 there would be no adverse effect.	Similar to alternative 1. Providing access to the historic structures and buildings at the Jones homesite has the potential to result in additional localized, long term to negligible to minor, adverse impacts. For section 106 there would be no adverse effect.	Same as alternative 2.	Same as alternative 2.	Same as alternative 1.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2. Providing access to the historic structures and buildings at the historic Jones homesite has the potential to result in additional localized, long term to negligible to minor, adverse impacts. For section 106 there would be no adverse effect.
Cultural Landscapes	Beneficial impacts on the landscape at the Boca Chita Key National Historic District, as well as other potential cultural landscapes because park properties would continue to be surveyed, inventoried, and evaluated to determine their eligibility for listing in the national register. Short-term and long-term, negligible to minor, adverse impacts on integrity of potential cultural landscapes at Boca Chita Key National Historic District as well as other potential cultural landscapes would persist due to wear and tear from visitor use. No new adverse impacts from proposed management actions. For section 106 there would be no adverse effect.	Similar to alternative 1. Localized, long-term, negligible to minor adverse impacts on potential cultural landscapes due to greater potential risk from expanded recreational use and increased visitor services, facilities, and access in some areas of the park. Localized, long-term, beneficial impacts on a potential cultural landscape at historic Jones homesite due to restoration activities. For section 106 there would be no adverse effect.	Similar to alternative 2. Beneficial impacts to a potential maritime cultural landscape due to elimination of fishing gear and anchoring and reduction in marine debris in the marine reserve zone. For section 106 there would be no adverse effect.	Same as alternative 3.	Similar to alternative 3. Greater beneficial impacts due to larger marine reserve zone would include more of a potential maritime cultural landscape. For section 106 there would be no adverse effect.	Similar to alternative 4. Greater beneficial impacts due to larger special recreation zone that includes more of a potential maritime cultural landscape. For section 106 there would be no adverse effect.	Same as alternative 6.	Same as alternative 4. Beneficial impacts to a potential maritime cultural landscape due to elimination of fishing gear and anchoring and reduction in marine debris in the marine reserve zone. Localized, long-term, negligible to minor adverse impacts on potential cultural landscapes due to greater potential risk from expanded recreational use and increased visitor services, facilities, and access in some areas of the park. Localized, long-term, beneficial impacts on a potential cultural landscape at historic Jones homesite due to restoration activities. For section 106 there would be no adverse effect.

TABLE 5. SUMMARY OF KEY IMPACTS OF IMPLEMENTING THE ALTERNATIVES

	ALTERNATIVE 1 — NO ACTION	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7	ALTERNATIVE 8
Impacts on Visitor Experience								
	Continued speed limitations in some marine areas would have negligible, long-term, adverse impacts on current visitor use patterns or opportunities. Under the no-action alternative, resource conditions and visitor experience would continue to degrade. Continued wide range of mixed use would result in visitor conflicts in some locations. Potential for increased crowding and conflict resulting in increased long-term, minor to moderate, adverse impacts on the quality and safety of park visit. Lack of visitor services and facilities to support access to park waters and keys would continue to result in long-term, minor to moderate, adverse impacts to visitors. No new adverse impacts from proposed management actions.	Additional speed limitations and new noncombustion engine use zone requirements would provide long-term, beneficial impacts on some visitors due to improved safety, reduced conflict, and the opportunity for increased solitude, and long-term minor, adverse impacts to other visitors due to potential exclusion. Long-term, beneficial impacts due to upgrades of visitor services and facilities.	Similar to alternative 2 with the addition of access-by-permit zones. Increased benefits and minor to moderate adverse impacts. Establishment of a marine reserve zone would result in beneficial impacts to snorkelers, scuba divers, and those who ride glass-bottom boats as they would be able to experience a healthy coral reef ecosystem, and to visitors who fish outside of the marine reserve zone due to spillover effect. Minor to moderate adverse impacts to visitors who formerly fished in the marine reserve zone.	Similar to alternative 2. Establishment of a marine reserve zone would have the same impact as those described in alternative 3.	Similar to alternative 3 with larger access-by permit and marine reserve zones. Increased benefits due to the larger protective zones.	Similar to alternative 4. Establishment of a special recreation zone with fishing permit requirements would result in beneficial impacts for snorkelers and scuba divers, and those who ride glass-bottom boats. Short-term, minor, adverse impacts on visitors who formerly fished in the special recreation zone and are unable to secure a special activity license.	Similar to alternative 6, except that the special recreation zone would have seasonal closures rather than fishing permit requirements. All fishers would have equal access to fish in the special recreation zone.	Additional speed limitations and new noncombustion engine use zone requirements would provide long-term, beneficial impacts on some visitors due to improved safety, reduced conflict, and the opportunity for increased solitude, and long-term minor, adverse impacts to other visitors due to potential exclusion. Long-term, beneficial impacts due to enhancements of visitor services in the Miami area, including new NPS concession services at Dinner Key. Establishment of a marine reserve zone would result in beneficial impacts to snorkelers, scuba divers, and those who ride glass-bottom boats as they would be able to experience a healthy coral reef ecosystem, and to visitors who fish outside of the marine reserve zone due to spillover effect. Minor to moderate adverse impacts to visitors who formerly fished in the marine reserve zone.
Impacts on Park Operations and Facilities								
	Continuing, long-term, minor to moderate adverse impacts on park operations and facilities due to unmet operational needs. No new adverse impacts from proposed management actions.	Short-term and long-term, minor to moderate, adverse impacts on park operations and facilities due to increased maintenance and operational demands for new zones and developments.	Similar to alternative 2 with increased law enforcement, administrative, and maintenance demands for access-by permit and marine reserve zones. On land areas there would be less impact on maintenance operations due to less proposed development.	Similar to alternative 3 with no access-by-permit law enforcement and administrative demands.	Similar to alternative 3 with increased operational demands due to larger access-by-permit and marine reserve zones.	Short-term and long-term, major, adverse impacts on park operations due to additional capacity needed to implement the special recreation zone and associated permit system. On land areas there would be less impact on maintenance operations due to less proposed development.	Similar to alternative 6. Less impact to administrative and law enforcement operations due to lack of permit system.	Short-term and long-term, minor to moderate, adverse impacts on park operations due to increased law enforcement, administrative, and maintenance demands for new zones including marine reserve zone. Short-term and long-term, minor to moderate, adverse impacts on facilities due to increased maintenance and operational demands for new developments. On land areas there would be less impact on maintenance operations due to less proposed development.

TABLE 5. SUMMARY OF KEY IMPACTS OF IMPLEMENTING THE ALTERNATIVES

	ALTERNATIVE 1 — NO ACTION	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7	ALTERNATIVE 8
Impacts on the Socioeconomic Environment								
	Existing contributions to the local and regional economies would continue to be long term and beneficial. Continuation of current management of boating and park fishery resources may result in long-term, minor adverse impact on tourism and associated service-related sectors that depend on a healthy park ecosystem. The existing level of access via private boat, available NPS concessioner/external guides and facility development such as docking and trail development would be inadequate to support the regional efforts in enhancing tourism and increasing visitor access and recreational opportunities in the area. The presence of the park would continue to provide a long-term, beneficial impact on the residents and property values in the nearby area. No new adverse impacts from proposed management actions.	Long-term beneficial economic impacts in the region due to relatively high level of visitor uses and experiences through new, expanded, and improved services (including concession services), facilities, and access to specific areas of the park. Adverse impacts now occurring on submerged aquatic communities including coral reef ecosystem, park fishery resources and habitats would persist—a potential long-term, minor, adverse impact on economic contributions derived from healthy submerged aquatic communities including coral reefs.	The strong emphasis on providing a balance between unrestricted access and enhanced resource protection and upgrading visitor services and facilities to accommodate these changes would have a long-term beneficial impact on the economy of the region. Establishment of a marine reserve zone would result in beneficial long-term impacts on recreational fishing, snorkeling, scuba diving, and associated service-related sectors which would enhance visitor experience due to improved resiliency of coral reef ecosystems. There would be some short-term, negligible adverse impacts on fishing guides who would no longer be able to fish in the marine reserve zone. There would be localized long-term, negligible adverse impacts on commercial fishers who no longer be able to fish in the marine reserve zone.	Similar to alternative 3. Beneficial impacts would be less than alternative 3 due to moderate levels of improvements in visitor services and facilities.	Implementing alternative 5 would have a long-term, minor, adverse impact and short-term and long-term, beneficial impacts on the economy in the region as visitor services and facilities improvements would be limited to those deemed essential.	Same as alternative 4.	Same as alternative 4.	The strong emphasis on providing a balance between unrestricted access and enhanced resource protection and upgrading visitor services and facilities to accommodate these changes would have a long-term beneficial impact on the economy of the region. Beneficial impacts would be less than alternative 3 due to moderate levels of improvements in visitor services and facilities. Establishment of a marine reserve zone would result in beneficial long-term impacts on recreational fishing, snorkeling, scuba diving, and associated service-related sectors which would enhance visitor experience due to improved resiliency of coral reef ecosystems. There would be some short-term, negligible adverse impacts on fishing guides who would no longer be able to fish in the marine reserve zone. There would be localized long-term, negligible adverse impacts on commercial fishers who no longer be able to fish in the marine reserve zone.

TABLE 6. THREATENED AND ENDANGERED SPECIES IMPACT DETERMINATIONS

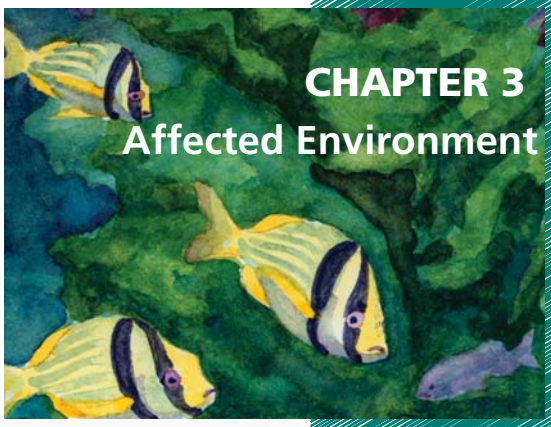
Species	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8 (preferred)
Florida manatee (*Trichechus manatu latirostris*)	No effect	May affect, not likely to adversely affect (NLAA)	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA
Sea turtles (*Caretta caretta*, *Chelonia mydas*, *Lepidochelys kempii*, *Eretmochelys imbricata*, and *Dermochelys coriacea*)	May affect, likely to adversely (LAA) effect three species, including *Caretta caretta, Chelonia mydas, and Eretmochelys imbricate*	LAA	LAA	LAA	LAA	LAA	LAA	LAA
American crocodile (*Crocodylus acutus*)	No effect	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA
Smalltooth sawfish (*Pristis pectinata*)[1]	LAA	LAA	LAA	LAA	LAA	LAA	LAA	LAA
Schaus swallowtail butterfly (*Heraclides aristodemus ponceanus*)	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA
Miami blue butterfly (*Cyclargus thomasi bethunebakeri*)	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA

TABLE 6. THREATENED AND ENDANGERED SPECIES IMPACT DETERMINATIONS

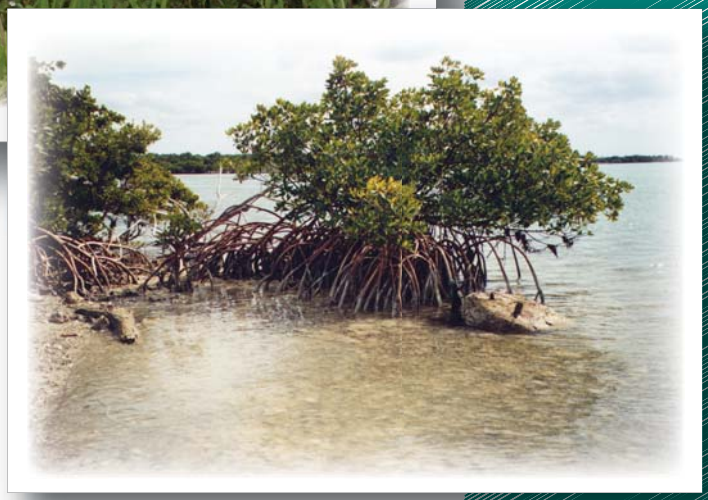
Species	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8 (preferred)
Stony corals (staghorn coral, *A. cervicornis*; elkhorn coral, *A. palmata*; pillar coral, *Dendrogyra cylindrus*; rough cactus coral, *Mycetophyllia ferox*; lobed star coral, *Orbicella annularis*; mountainous star coral, *Orbicella faveolata*, boulder star coral, *Orbicella franksi*	LAA	LAA	LAA	LAA	LAA	LAA	LAA	LAA

1. In addition to the three species indicated as LAA, the National Marine Fisheries Service, in a biological opinion dated 9/19/2012, and the U.S. Fish and Wildlife Service in a consultation letter dated 5/22/2014, noted the proposed action is not likely to adversely affect *Lepidochelys kempii* and *Dermochelys coriacea*.

2. As provided in 50 CFR 402.16, the final NPS preferred alternative 8 does not change the proposed actions that prior consultation process addressed and reinitiating of formal consultation is not required.



CHAPTER 3
Affected Environment



INTRODUCTION

This chapter describes the existing environment of Biscayne National Park and the surrounding region. It is focused on the park resources, uses, facilities, and socioeconomic characteristics that have the potential to be affected if any of the alternatives were implemented. Some features, such as endangered species, are discussed because they provide context or must be considered in an environmental impact statement.

This chapter is organized into five sections: Natural Resources, Cultural Resources, Visitor Experience, Park Operations, and Socioeconomics.

NATURAL RESOURCES

Biscayne National Park is south of downtown Miami at the northernmost extremity of the Florida Keys. The park is a unique subtropical marine and estuarine environment of national significance, renowned for its productive coral reefs, diverse and abundant natural resources, and spectacular scenic beauty. The park includes the southern two-thirds of Biscayne Bay.

Biscayne National Park consists of the following four primary ecosystems:

1. the beginning of the third-largest coral reef in the world
2. the southern expanse of Biscayne Bay
3. a narrow fringe of mangrove forest along the mainland shoreline
4. the northernmost islands of the Florida Keys

Each of these ecosystems is composed of a variety of smaller communities like seagrass meadows, hardbottom areas, and hardwood hammocks. The geology of the area has been influenced by changing sea levels, currents, hurricanes, and reef-building organisms like corals. South Florida's subtropical climate produces forest types that are more typical of the Caribbean than of mainland North America.

Of the approximately 173,900 acres within park boundaries, about 95% (165,000 acres) is water, and the balance consists of emergent lands (keys and mainland). About 72,000 acres of the park contain coral reefs. About 9,100 acres are shoreline and keys. There are 42 islands or keys in the park.

The southern tip of the Florida peninsula is a complex, water-dependent ecosystem resulting from a combination of its climate and physiographic setting. The northern extremity of the South Florida ecosystem is just south of the Orlando area in the Kissimmee River drainage. Water once flowed freely from the Kissimmee River to Lake Okeechobee and southward through the Everglades to the estuaries of Biscayne Bay, the Thousand Islands, and Florida Bay.

In the late 1800s, colonial settlers moved into Florida and began efforts to reclaim land although the area was viewed as "worthless swamps." These efforts to reclaim lands primarily focused on construction of drainage canals and levees. In 1948, Congress authorized the Central and South Florida Project. This project involved the construction of an elaborate network of roads, canals, levees, and water-control structures throughout South Florida. The purposes of this project were to provide water and flood protection for urban and agricultural lands. Today, the National Park Service is part of an intensive effort to restore the South Florida ecosystem, trying to mitigate the impacts of this past massive land reclamation effort.

The unique biophysical environment of Biscayne National Park supports a rich base of natural resources, including a unique combination of habitats, fishery resources, wildlife, and physical environment.

THE BAY

The topography of Biscayne Bay is a basin, with shallow areas ranging from 0 to 6 feet (0 to 2 meters) along the western and eastern sides of the bay) with deeper areas ranging from 6 to 12 feet (2 to 4 meters) in the central portion of the bay (Ault et al. 2001). Voss et al. (1969) reports that the bay is a relatively enclosed body of water with limited exchange with the offshore area. The bay is affected by atmospheric conditions and thus has seasonal changes in temperature and salinity.

Bottom substrates of the bay can be grouped into three basic types: seagrass, hardbottom,

and barebottom. Seagrass consists of sandy or silt-clay sediments vegetated by turtle grass (*Thallasia* spp.), Cuban shoal grass (*Halodule* spp.), or manatee grass (*Syringodium* spp.). The productivity of these areas is very high, and they serve as nursery grounds for shrimp, lobster, and many species of fish.

Seasonal salinity patterns in the bay highlight three broad regions with respect to magnitude and variability of salinity. The first region is in the eastern bay adjacent to the Atlantic Ocean, which is characterized by near oceanic salinities (32–36 parts per million [ppm]) that vary little throughout the year. The mid-basin region shows variability based on the wet and dry seasons. It is characterized by somewhat lower than average salinities (20–28 ppm) during the peak wet season because of increased freshwater inflow (July–September). The third broad area is on the western side of the bay, which is a lower salinity region with high variability caused by the freshwater discharges from drainage canals (Ault et al. 2001).

A major threat to seagrass communities is the scarring from boat propellers. Miami-Dade, Broward, Monroe, Palm Beach, Lee, and Collier Counties have more than 200,000 registered vessels. In addition to an increasing number of registered vessels, the average size and horsepower of the vessels have increased. The increasing numbers and size of vessels have been a detriment to the seagrass communities. Sargent et al. (1995) reports that about 11,200 acres of seagrasses in Miami-Dade County show light, moderate, or severe scarring by boat propellers.

The hardbottom is characterized by a foundation of oolitic limestone covered by a thin sediment layer populated with a variety of soft corals and sponge species.

The barebottom is substrate that is generally devoid of large benthic organisms. This community is typically found in deeper portions of the bay and along the eastern side of the bay, along the keys.

Climate change is anticipated to have a variety of impacts on natural resources in Biscayne National Park. One aspect of climate change that will affect the bay, as well as several other impact topics below, is the amount and rate of sea level rise. Model predictions indicate that sea level could rise from 4 to 9 inches by the middle of this century (IPCC 2007), and from 9 to 22 inches by the end of the century, depending on the emissions scenario model (NRC 2008). The rate and amount of sea level rise is difficult to predict, but will likely have effects on park facilities and visitor opportunities in Biscayne Bay.

Facilities such as docks, boat/paddlecraft landing sites, and the stone wall and visitor amenities on Boca Chita Key are examples of resources that may be affected by sea level rise. While the model predictions include a time span greater than the lifetime of this plan, the next 20 years will provide information on the rate and amount of sea level rise so that park managers can respond to impacts on resources in Biscayne Bay and throughout the park.

Harmful algal blooms that can smother coral reefs and cause mortality in fish are likely to increase with increased water temperatures (Florida Oceans and Coastal Council 2009). Algal blooms are also equally likely to result from eutrophication (nitrogen and phosphorus-based fertilizers washing into the bay). Warm water also holds less oxygen than cooler water, which affects both marine plant and animal species. Lower dissolved oxygen levels are expected to act synergistically with increased nutrient loading into Biscayne Bay, causing stress or mortality to flora and fauna in coastal and ocean waters.

THE MANGROVE SHORELINE

Mangroves are shoreline trees that live in the intertidal area. Four species of trees are considered mangroves in South Florida: red mangrove (*Rhizophora mangle*), white mangrove (*Laguncularia racemosa*),

buttonwood (*Conocarpus erectus*), and black mangrove (*Avicennia germinans*).

Mangroves are important as the basis of the detrital food chain in estuarine waters (USFWS 1999). The detritus provided by decomposition of mangrove leaves is the food base for microcrustaceans and other detrital processors that are consumed by macrocrustaceans, small fishes, and other first-order predators. These animals in turn are the prey of larger fish species, such as snook (*Centropomus* spp.), snappers (*Lutjanus* spp.), and jacks (*Caranx* spp.).

In addition, mangroves provide important habitat for a wide variety of species. The U.S. Fish and Wildlife Service (1999) estimates that at least 1,300 species of animals rely on mangroves for habitat.

Mangroves are mostly found along the western side of the park, along the shoreline of the mainland. Mangroves are also found on the eastern and western sides of Sands and Elliott Keys, the Rubicon Keys, Totten Key, and in Jones Lagoon. Several of the overwash islands in the southern part of the park are made up almost entirely of mangroves.

Coastal development in Florida has dramatically reduced the size and abundance of mangrove communities throughout the state. Wetland areas, and mangroves, are often dredged and filled to create waterfront property. The shoreline in the park represents one of the largest undeveloped shorelines along the east coast of Florida.

On the mainland shoreline of the park, mangroves are replacing some estuarine areas. Mangrove areas support lower biodiversity than the estuarine areas they are replacing, which would reduce overall habitat diversity in the park. Mangrove distribution is also expected to shift northward as temperatures rise on the Florida coast (Florida Oceans and Coastal Council 2009).

THE KEYS

The park contains 42 islands, or keys. These islands are at the northern end of the coral rock Florida Keys. Most of these islands are the remains of coral reefs that formed when ocean waters were higher. As the sea receded, the reef was exposed, forming the islands.

Elliott Key, the largest island in the park, is the true northernmost Florida Key. The islands from Sands Key north are considered "transitional" islands, meaning they share some of the features of the hard rock coral keys to the south and some of the features of the sand barrier islands to the north.

The islands are typically vegetated with subtropical species. The outer perimeters of the islands are typically vegetated by mangrove forest. As you move inward and gain elevation, the species become more upland species. The canopy is a mixture of tropical trees such as wild lime, gumbo limbo, willow bustic, and pigeon plum.

With this overview of the park's natural resources, the rest of this section describes more specifically which natural resources might be affected by implementing the alternatives.

FISHERY RESOURCES

Both recreational and commercial fishing occur in the park under the authorities described in chapter 2 and summarized in appendixes A and B. These activities will continue to occur in the park subject to state regulations, NPS mandates, and legislation. Fishing regulations in Biscayne National Park are the same as those in state waters with the following exceptions: (1) a ban on lobster harvest within Biscayne Bay waters, (2) reduced bag limit of lobsters within park waters not in the bay during the two-day sport season, and (3) a ban on sponge harvest and ornamental marine life (fish, invertebrates, and plants) harvest within all waters of the park. New state fishery regulations for the

park will be proposed in accordance with the park's *Fishery Management Plan*, which is a cooperative effort between the State of Florida and the National Park Service and is described in more detail in chapter 1.

Harvesting sea life (fish, crustaceans, etc.) is allowed according to state regulations. Thus, the park must balance the existence of recreational and commercial fishing in park waters with its mandate and responsibility to manage fishery resources in a way that such resources remain unimpaired (NPS 2008).

The park provides habitat for many species of fish such as bonefish, snook, tarpon, permit, pink shrimp, spotted sea trout, oysters, clams, blue and stone crabs, bait fishes, and numerous coral reef fishes including snappers, groupers, grunts, barracuda, spadefish, spiny lobster, parrotfish, surgeonfish, and triggerfish. There are more than 325 fish and marine macroinvertebrate species in the park; 150 of these species are subject to some form of pressure from recreational and commercial fishing activities (Ault et al. 2001).

It is likely that the recreational fishing pressure in the park has increased in the past decades. This is based on the following:

- The human population of Florida has been growing at a phenomenal rate. The population of Miami-Dade County grew from just under 5,000 residents in 1900 to almost 2.5 million in 2010 (U.S. Census Bureau: State and County Quick Facts 2014a).
- The FWC (in 2001) determined that the sales of resident saltwater fishing licenses from 1990 through 1998 tracks the increase in Florida's population. Therefore, fishing activity can be used as a general proxy for understanding population growth and activity in the vicinity of the park.
- The NOAA / Fisheries Marine Recreational Fishery Statistics Survey (MRFSS) data show a statistically significant increasing trend of the number of people participating in fishing along the east coast of Florida (NMFS 2001). Through 2007, fishery participation had a significant increase, but began to decrease in 2008. The number of anglers has stabilized since then (NMFS 2014b).
- Additionally, the MRFSS data show a statistically significant increasing trend in the number of fishing trips anglers are taking along the east coast of Florida (NMFS 2001).
- The recreational vessel fleet in South Florida (Broward, Collier, Miami-Dade, Monroe, and Palm Beach Counties) has grown substantially. The number of licensed vessels grew by 444% between 1964 and 1998 (Ault et al. 2001).
- The fishing efficiency has increased over time because of the continued advances in technology such as fish finders, depth indicators, global positioning systems, improved vessel design, increased engine horsepower, and radio communications.

Although it occurs there, commercial fishing has been prohibited in Biscayne National Park for more than 30 years (48 *Federal Register* [FR] 30282, June 30, 1983). Federal regulations prohibit commercial fishing "except where specifically authorized by federal statutory law" (36 CFR 2.3(d)(4)). This regulation reflects long-standing NPS policy that commercial fishing is only allowed in park units when specifically authorized by federal law (statute or regulation). NPS *Management Policies 2006* (4.4.3 and 8.2.2.5) clarify that a park's enabling act must do more than simply state that "fishing" shall be permitted in order to specifically authorize commercial fishing under policy or law. Congress did not specifically authorize commercial fishing at Biscayne National Park. The enabling act refers only to "fishing," which the National Park Service has long interpreted as not being sufficient to constitute a specific authorization for commercial fishing. This interpretation is

consistent with the designation of the 1968 monument as Biscayne National Park in 1980. In recommending that the monument be designated as a national park, the House of Representatives Committee on Interior and Insular Affairs explained that national parks "tend to be areas where nature displays her processes unfettered, and commercial resource utilization is forbidden or forcefully curtailed to every possible extent" (U.S. Congress n.d.). As a result, the park's enabling act does not authorize commercial fishing in the park.

The National Park Service can manage or prohibit commercial fishing in the park using its authority under the 1916 Organic Act. In fact, the Biscayne National Park enabling act directs the Secretary of the Interior to preserve and administer the park in accordance with the 1916 Organic Act (16 USC 410gg-2). Under the proposed rule, the National Park Service would authorize commercial fishing in the park, as required by NPS *Management Policies 2006* (4.4.3 and 8.2.2.5). The general prohibition on commercial fishing at 36 CFR 2.3(d)(4), which prohibits commercial fishing except where specifically authorized by federal statute, would be modified by the proposed rule that would allow commercial fishing in Biscayne National Park through a special regulation, as permitted by 36 CFR 1.2(c). Courts have recognized the limited, discretionary authority of the Secretary of the Interior, acting through the National Park Service, to authorize and phase-out commercial fishing through regulations. The proposed rule would implement a lifetime, nontransferable commercial fishing permit program that would authorize certain types of commercial fishing but ultimately phase-out this activity entirely to protect park resources and values as provided for in the park's *Fishery Management Plan* (NPS 2014).

From 1964 to 1998, the commercial fishing fleet in South Florida has grown 197% (Ault et al. 2001). Aside from the direct removal of fish and shellfish by commercial fishing, intensive use of fishing gear on seagrass, hardbottom, and coral reef communities have also raised great concern. The park is fished commercially for a variety of finfish (such as grouper and snapper); a variety of macroinvertebrates including lobster, crab, and shrimp; and other fish species that are used as bait (such as herring and ballyhoo).

Similar to the recreational fishing fleet, the commercial fishing fleet's efficiency has increased because of improved vessel design; more powerful propulsion systems; and improved equipment such as fish finders, depth gauges, and global positioning systems (GPS) (Ault et al. 2001).

The preponderance of data suggest that numerous fish stocks in the park are heavily exploited and/or overfished, as defined in the Magnuson–Stevens Fishery Conservation and Management Reauthorization Act of 2006. This is based on the following information:

- As discussed above, the park has been subjected to considerable and consistent fishing pressure.
- According to Ault et al. (2001), 77% of the 35 fish stocks are overfished. This claim is based on the federal definition of overfishing found in the Magnuson–Stevens Fishery Conservation and Management Reauthorization Act of 2006.
- The South Atlantic Fishery Management Council (NMFS 2001) has listed 14 species in the federal waters of the Atlantic off the coast of North Carolina, South Carolina, Georgia, and Florida as being overfished. Six of these species occur in the park and include goliath grouper, Nassau grouper, gag grouper, black grouper, vermillion snapper, and yellowtail snapper.
- Stock biomass is critically low for most of the targeted species in the recreational fishery (Ault et al. 2001).
- Preliminary analysis from a reef fish visual census performed in 2002 by

NOAA Fisheries / University of Miami–Rosenstiel School of Marine and Atmospheric Science indicated that groupers and snappers (highly desirable reef fish) were smaller in the park compared to areas with lower fishing pressures (J. Ault and S. Smith 2002).

In addition to fishing pressure, hydrological processes in the region have changed substantially because inland water management actions have altered the freshwater flows entering the park and therefore the ecology of the bay. The increasing human population has also resulted in extensive coastal development, which has resulted in the loss of extensive areas of coastal wetlands. These wetlands provide habitat for a variety of fish species. Serafy et al. (1997) report that many estuarine fishes and shellfish, namely the larger drum species and oysters, have precipitously declined because of the reduction or elimination of once extensive freshwater and brackish water habitats.

Climate change is expected to impact fishery resources in Biscayne National Park. Warmer sea surface temperatures are expected, which is anticipated to contribute to increased incidences of disease in marine fishery resources. Die-offs in reef fish have already increased with more outbreaks of Brookynella, a marine disease caused by a parasitic protozoa. Some fish species that cannot move to cooler waters, either north or deeper in the water column, may also be impacted by warmer sea surface temperatures. Changes in acidity (pH), nutrients, and dissolved oxygen in the water are likely to affect vegetation, invertebrates, and coral reef habitat that support many fish species in the park. The outcome of some of these changes cannot be determined yet, but the causes of change such as increased sea water acidity are already being documented (Florida Oceans and Coastal Council 2009). Ocean acidification, for example, can affect marine ecosystems by altering the planktonic base of the food web. Waterbirds, among other fauna, will likely be affected at a global scale by reducing production of their direct prey or reduction in the base of their food webs and habitat such as coral and oyster reefs (Ogden et al. 2014).

The fossil record indicates that fish species change regional distribution during periods of climate change; however, air and water temperatures are currently changing at much faster rates than in the past. Therefore, the ability of these species to respond to climate change has not been ascertained.

LISTED SPECIES

The Endangered Species Act of 1973 prohibits the taking of any species listed by the U.S. Fish and Wildlife Service as being either threatened or endangered. Harming such species includes not only directly injuring or killing them, but also disrupting the habitat on which they depend. Section 7 of the act also requires federal agencies to consult with the U.S. Fish and Wildlife Service or NOAA Fisheries when any activity permitted, funded, or conducted by that agency may affect a listed species or designated critical habitat or is likely to jeopardize proposed species or adversely modify proposed critical habitat.

This section, along with the impacts analysis for the preferred alternative in chapter 4 of this plan, fulfills the National Park Service obligation under section 7 to document federally listed species and impacts of the final NPS preferred alternative (alternative 8) on these species via an embedded biological assessment.

Table 7 lists the federal threatened and endangered species that could potentially be found in the national park due to the presence of appropriate habitat.

TABLE 7. FEDERALLY LISTED AND CANDIDATE SPECIES KNOWN TO OCCUR IN BISCAYNE NATIONAL PARK

Common Name	Scientific Name	Federal Status / Notes[1]
Mammals		
West Indian manatee	*Trichechus manatus*	E, CH
Reptiles		
Green sea turtle[2]	*Chelonia mydas*	E
Hawksbill sea turtle[2]	*Eretmochelys imbricata*	E
Leatherback sea turtle [2]	*Dermochelys coriacea*	E
Loggerhead sea turtle[2]	*Caretta caretta*	T
Kemp's Ridley sea turtle [2]	*Lepidochelys kempii*	E
American crocodile	*Crocodylus acutus*	T, CH
American alligator	*Alligator mississippiensis*	T/SA
Eastern indigo snake	*Drymarchon corais couperi*	T
Fishes		
Smalltooth sawfish [3]	*Pristis pectinata*	E
Invertebrates		
Schaus swallowtail butterfly	*Heraclides aristodemus ponceanus*	E
Miami blue butterfly	*Cyclargus thomasi bethunebakeri*	E
Staghorn coral[3]	*Acropora cervicornis*	T, CH
Elkhorn coral[3]	*Acropora palmata*	T, CH
Boulder star coral[3]	*Orbicella franksi*	T
Mountainous star coral[3]	*Orbicella faveolata*	T
Lobed star coral[3]	*Orbicella annularis*	T
Pillar coral[3]	*Dendrogyra cylindrus*	T
Rough cactus coral[3]	*Mycetophyllia ferox*	T
Plants		
Florida semaphore cactus	*Consolea corallicola*	E, CH
Birds		
Red knot	*Calidris canutus rufa*	T

[1]E=Endangered; T=Threatened; SA=Similarity of Appearance to a listed species, CH = Critical Habitat designated

[2]Sea turtles are jointly administered. NOAA Fisheries has the lead responsibility for the conservation and recovery of sea turtles in the marine environment, and U.S. Fish and Wildlife Service has the lead responsibility for the conservation and recovery of sea turtles on nesting beaches.

[3]NOAA Fisheries has lead responsibility rather than the U.S. Fish and Wildlife Service.

NOTE: Per NPS policy, the park manages both federally listed and species of concern as if listed.

Since the release of the 2011 Draft Plan, five new stony coral species that occur throughout the park have been listed as threatened species under the Endangered Species Act. Two species of acroporid corals remain listed as threatened (NMFS 2014b).

In addition, the Miami blue butterfly, analyzed in the 2011 Draft Plan as a special status species, is now listed as endangered under the Endangered Species Act. Similarly, the Florida semaphore cactus, analyzed in the 2011 Draft Plan as a candidate species, is now listed as endangered. Critical habitat for the Florida semaphore cactus has been proposed on Swan Key. The previously unlisted red knot is now listed as a threatened species under the Endangered Species Act.

Florida Manatee

The Florida manatee (*Trichechus manatus latirostris*) is a distinct subpopulation of the West Indian manatee. The manatee is a federally listed endangered species (USFWS 1999), which can be found in fresh, brackish, and marine habitats. During the cold winter temperatures, the manatees concentrate around peninsular Florida. In the summer, their range expands as far north as Rhode Island on the East Coast and as far west as Louisiana on the Gulf Coast. During the January 1992 aerial survey of warm water refugia, the most manatees counted was 1,856 individuals (USFWS 2001).

Manatees prefer grazing on seagrass in shallow water adjacent to deep channels. The deep channels allow manatees to seek shelter from boats. In the park, manatees are found mainly in near-shore environments where the water is warm and there is abundant seagrass. Black Point and Convoy Point have the greatest concentration of wildlife. In the winter, manatees may also be found near Stiltsville, and there have been sightings in the tidal creeks between the islands. Sightings on the eastern side of Biscayne Bay are rare, probably because there is less seagrass for the manatees to eat. The park, in cooperation with the state and Miami-Dade County, has implemented a slow speed zone along the entire mainland coastline in the park. This zone extends out 1,000 feet from the mainland shoreline. The slow speed zone in the park is consistent with areas so designated outside park boundaries. These zones are designed to provide boat operators time to react when they observe manatees, reducing the potential of striking the animals (Dade County DERM 1996).

Miami-Dade County Department of Environmental Resources Management (DERM) conducts quarterly manatee surveys, including the waters in the park. These surveys have shown the highest use of the park by manatees occurs during the winter. The park's winter manatee population averages 100 animals (DERM, Mayo, pers. comm., 2002). Manatees are typically seen close to the shore between Convoy Point and Black Point.

Mortality data collected since 1974 indicate a clear increase in manatee deaths during the last two decades. The largest source of human-related manatee mortality is collisions with motorized watercraft. An analysis of the injuries of 406 manatees killed by watercraft and recovered between 1979 and 1991 indicates that 39% of the animals died from propeller cuts, 55% died from impacts from boat watercraft hulls, and 4% died from both. The analysis determined that most of the propeller wounds are caused by medium to large boats, but the impact wounds were from fast-moving small or medium boats. Between 1996 and July 1999, an average 24% of all manatee deaths were caused by watercraft hull impacts or propellers (MPPRC 2009).

Sea Turtles

There are five federally listed species of sea turtles in Florida. Three of these species—loggerhead (*Caretta caretta*), hawksbill (*Eretmochelys imbricata*), and green (*Chelonia mydas*) sea turtles—may use park waters (USFWS 2010). The National Park Service has

recorded two species of sea turtles (loggerhead and hawksbill) nesting in the park. However, nesting by hawksbills has only been documented in the park four times and not since 1990. The most common turtle recorded in the park is the loggerhead. Sea turtle nesting activity has been documented on Elliott Key, Boca Chita Key, Sands Key, and historically but not recently on Soldier Key. Nesting on Soldier Key may have ceased because red mangrove has become established along the shoreline and prevents turtle access to the beach.

The loggerhead was listed as threatened in 1978 in accordance with the Endangered Species Act of 1973. The hawksbill sea turtle was listed as endangered in 1970. Internationally, all species of sea turtles are considered endangered by the International Union for Conservation of Nature (IUCN) and listed in appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

The southeastern U.S. nesting aggregation of loggerhead turtles is of paramount importance to the survival of the species and may be second in size only to the nesting aggregation of the islands in the Arabian Sea. It is estimated that most loggerhead nesting in the southeastern United States occurs in six Florida counties—Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward.

During sea turtle nesting season (May through October), the beaches of Elliott Key are monitored daily and mesh screens are placed on newly discovered nests to prevent predation by raccoons, ghost crabs, and other predators. The beaches of Elliott Key are not closed to the public during nesting season, but due to the limited accessibility of these beaches, public use remains low and does not pose a threat to sea turtle nesting.

From 1991 through 2009, the park has documented 209 sea turtle nests and 297 "false crawls," which occur when a turtle leaves the water to nest and returns to the water without laying eggs. Factors that may contribute to a false crawl include the presence of coral rubble, marine debris, rocks, or vegetation. In many instances no obvious reason why the emergence did not result in nesting can be determined (NPS 2001a).

A major threat to turtle nests in the park is predation by raccoons, fire ants, and ghost crabs. During the last 10 years, 51% (n=72) of the nests were affected by predation. Of these nests, 30 were totally destroyed and 22 were partially destroyed. On Elliott Key, the majority of predated nests have been attributed to raccoons. Sea turtles may be injured or killed from collisions with boats. On average, park staff report that three to six turtles a year have been killed by these collisions. Sea turtles can also be injured or drown from entanglement in marine debris, including commercial fishing gear. It is likely that additional undocumented turtle deaths occur from these sources.

American Crocodile

The American crocodile inhabits coastal waters of South Florida, the Caribbean, Mexico, Central America, and northern South America. South Florida represents the northern limits of its range. Crocodiles were listed as endangered throughout their range in 1975, and critical habitat was established for the species in 1979 (USFWS 1999). The crocodile is currently listed as threatened (USFWS 2014). The listing of the species and the protection of habitat were required because of documented population declines most likely associated with habitat alterations and direct human disturbances of American crocodiles and their nests (USFWS 1984). The current distribution of American crocodiles is limited to extreme South Florida, including coastal areas of Miami-Dade, Monroe, Collier, and Lee Counties.

Crocodile habitat is typically along the shoreline in the mangroves and in the canals. The U.S. Fish and Wildlife Service has designated all land and waters encompassed by a line beginning at Turkey Point, traveling

southeast to the southernmost point of Elliott Key and southwest along the eastern shorelines of the keys to the park boundaries as critical habitat (USFWS 1999).

In Biscayne Bay, crocodiles have been observed as far north as Chatman Field. However, the greatest concentration of crocodiles near the park is in the cooling canals of the Turkey Point Nuclear Generating Station. Significant nesting activity occurs in these waters. Although crocodiles are not nesting in the park, the park provides important habitat for subadult crocodiles (two to eight years old) that typically avoid the adults. According to Mazzotti and Cherkiss (1998) the combination of the nesting area in the Turkey Point area and the refugia of coastal areas of the park for the subadults have been essential to the survival of the species in Florida. The park has received reports that a crocodile has been seen on the eastern side of Biscayne Bay near Elliott Key Harbor. During the summer of 2010, a crocodile was frequently observed in the shallow waters immediately surrounding the visitor center and boardwalk/jetty area. If the population of crocodiles continues to increase at its current rate, the potential exists for visitor-crocodile conflicts, and these conflicts would be managed on a case-by-case basis in which a variety of regulatory actions, such as temporary or permanent restrictions on swimming, fishing, and/or dog access, would be considered and implemented.

Smalltooth Sawfish

Smalltooth sawfish (*Pristis pectinata*) commonly reach 18 feet (5.5 meters) in length, and may grow to 25 feet (7 meters) (NOAA 2005). Little is known about the life history of these fish, but they may live up to 25–30 years and mature after about 10 years. Like many elasmobranchs, smalltooth sawfish are ovoviviparous, meaning the mother holds the eggs inside her until the young are ready to be born, usually in litters of 15 to 20 pups.

Sawfish species are usually found in shallow waters close to shore over muddy and sandy bottoms. Smalltooth sawfish have been reported in both the Pacific and Atlantic Oceans, but the U.S. population is found only in the Atlantic. Historically, the U.S. population was common throughout the Gulf of Mexico from Texas to Florida, and along the east coast from Florida to Cape Hatteras. The current range of this species has contracted to peninsular Florida. Smalltooth sawfish are relatively common only in the Everglades region at the southern tip of the state. No accurate estimates of abundance trends over time are available for this species. However, available records, including museum records and anecdotal fisher observations, indicate that this species was once common throughout its historic range and that smalltooth sawfish have declined dramatically in U.S. waters over the last century.

Sawfish are extremely vulnerable to overexploitation because of their propensity for entanglement in nets, their restricted habitat, and their low rate of population growth. The decline in smalltooth sawfish abundance has been caused primarily by bycatch in various fishery resources, including being entangled in trawl nets and being caught on hook-and-line. Degradation of the mangrove shorelines used by both juvenile and adult sawfish (NMFS 2009) is a secondary factor contributing to smalltooth sawfish decline.

Although sightings are very rare, smalltooth sawfish have been observed from various areas of the park, including in marked channels and close to coastlines. The Florida Museum of Natural History's National Sawfish Encounter Database reports a total of nine encounters (sightings and/or captures) reported from within Biscayne National Park boundaries from 1998 through 2009. Some encounters have been reported from deeper water reef habitats within the park. Information is lacking regarding historical abundance or distribution in Biscayne Bay.

The primary factor affecting smalltooth sawfish within Biscayne National Park is bycatch from hook-and-line fishing activity. Since smalltooth sawfish can be caught on hook-and-line, this species could be negatively affected if commercial or recreational hook-and-line fishing increased. Assuming sawfish would be released following an accidental catch, the fish could still suffer stress and injury associated with being landed. Sawfish sightings and catch-and-release events in the park are both very rare, although up to 30 catch-and-releases are reported annually in nearby Everglades National Park (T. Schmidt, Everglades National Park, pers. comm.).

Schaus Swallowtail Butterfly

The Schaus swallowtail butterfly (*Papilio aristodemus ponceanus*) was first described in 1911 from collections in the Miami area. Between 1924 and 1981 there was a general decline in range and numbers. The species was listed as threatened in 1976 because of population declines caused by the destruction of its tropical hardwood hammock habitat, mosquito control practices, and over-harvesting by collectors. The Schaus swallowtail butterfly was reclassified to an endangered species in 1984 because its numbers and range had declined dramatically since its initial listing (USFWS 1999).

The butterfly occurs exclusively in subtropical hardwood hammocks. Hammocks are now extensive only in the Upper Keys in Miami-Dade and Monroe Counties. About 43% of the remaining suitable habitat is in Biscayne National Park. Most of the population in the park is found on Elliott Key, with smaller populations on Adams, Old Rhodes, Swan, and Totten Keys.

Between 1985 and 1990, the Elliott Key population fluctuated between 600 to 1,000 adults annually, with smaller populations of 50 to 100 individuals on each of the other keys. Surveys following Hurricane Andrew (1992) revealed that the park's population was reduced to 58 individuals. However, in 1994 the population rebounded to more than 600 and was presumed to be stable (Emmel 1995).

In 2000, the population of the Schaus swallowtail butterfly inside Biscayne National Park represented the largest numbers remaining in the species' range. The park continues to provide crucial protected habitat for this endangered butterfly. According to Emmel (2000), the estimated adult population size for the Schaus swallowtail inside the park in 2000 was 260 to 300 individuals. The population in the park has fallen to less than 300 per year since 2000, and only 69 adults have been observed on Elliott Key over three years during annual monitoring between 2007 and 2009 (Minno and Minno 2009).

Miami Blue Butterfly

The Miami blue butterfly (*Cyclargus thomasi bethunebakeri*) is a federally listed endangered species. The Miami blue is one of the most imperiled insects in the United States. The butterfly prefers pine rock lands, beach scrub, and tropical hardwood hammock habitat.

Threats to the butterfly's continued survival in the wild include impacts from hurricanes, freezes, illegal collecting, low genetic diversity, and an increasing lack of natural habitat. Because of the loss of coastal habitat, the state lists the nickel-sized Miami blue as an endangered species.

Florida Museum lepidoptera researchers are working to recover the Miami blue to ensure that it remains a part of Florida's rich mix of native fauna. A few thousand captive-hatched caterpillars have been reintroduced on Elliott Key in the park with the objective of establishing an experimental population. Management of this species is currently covered by a monitoring and recovery plan.

Stony Corals

Elkhorn coral (*Acropora palmata*) and staghorn coral (*Acropora cervicornis*) are federally listed as threatened under the Endangered Species Act. Within Biscayne National Park, elkhorn coral is more abundant than staghorn coral, although they often are found together in various places throughout the park. These two corals are more commonly observed in the southern reefs of the park. Additionally, all waters east of the chain of islands running from north to south in the park are included in an area that has been designated as critical habitat for elkhorn and staghorn corals. The NOAA Fisheries draft recovery plan for elkhorn and staghorn coral was published in September 2014 (NMFS 2014b).

Stony corals can be adversely affected by a variety of factors including fishing, pollution, vessel groundings, sedimentation, macroalgal overgrowth, disease, and increasing sea temperatures. Anticipated impacts to the federally listed species are discussed under the special status species of each alternative within chapter 4. These impacts are similar to impacts to all other corals in the order Scleractinia (which are all protected from harvest within the state of Florida) and the coral reef habitat in general, which are discussed under the "Submerged Aquatic Communities" impact topic.

In addition to elkhorn and staghorn coral, five other stony coral species that occur throughout the park are listed as threatened species under the Endangered Species Act. These other coral species would experience similar impacts from alternatives 1–5 as described for stony corals.

FEDERALLY LISTED SPECIES DISMISSED FROM FURTHER ANALYSIS

The wood stork, eastern indigo snake, and the Key Largo woodrat were considered but dismissed from further analysis. Wood storks are rarely seen and do not breed within the park. There is only one record of an eastern indigo snake in the park and no records to document the existence of the Key Largo woodrat in the park. Suitable habitat exists on the mainland and the keys, and reintroduction efforts for this species could be considered. Areas in the park that are considered their preferred habitat would not be physically disturbed by the alternatives proposed in this plan.

The Florida semaphore cactus is dismissed because it exists on a protected key within the park and would not likely be affected by actions proposed in the plan. The red knot has been documented during winter months in an unprotected area within the park's multiuse zone; however, none of the GMP management actions are expected to affect this species, and red knot has been similarly dismissed from further analyses.

Similarly, the piping plover, Key Largo cotton mouse, and roseate tern are dismissed from further analyses because they either migrate through or are not documented within the park. Beach jacquemontia and Johnson's seagrass are not found in the park but suitable habitat for these plants does exist. However, the quality of potential habitat would not be degraded by any of the alternatives proposed in this plan so they are dismissed from further analyses.

STATE LISTED SPECIES

Birds

In addition to species listed under the Endangered Species Act, the state recognizes species as being imperiled. Several of these state listed species include the bald eagle (*Haliaeetus leucocephalus*), white ibis (*Eudocimus albus*), reddish egret (*Egretta rufescens*), roseate spoonbill (*Platalea ajaja*), tri-colored heron (*Egretta tricolor*), osprey (*Pandion haliaetus*), white-crowned pigeon (*Patagioenas leucocephala*), and the snowy egret (*Egretta thula*) use habitats in the park. Many of these species are water-associated

birds that use one or more coastal habitats in Biscayne National Park for nesting, foraging, roosting, and/or loafing. Arsenicker Key, West Arsenicker Key, Mangrove Key, islands in the interior of Jones Lagoon, Ragged Key #5, and Soldier Key contain nesting colonies for white ibis, reddish egrets, tri-colored herons, and/or white-crowned pigeons. These islands also host nesting colonies of double-crested cormorants. Bald eagles also nest on West Arsenicker Key and the mainland south of Black Point. Ragged Key #5 is currently an in-holding (not owned by the National Park Service) and therefore there are no zoning proposals for this area within this plan.

Nesting birds respond to disturbance in different ways in different areas, depending on type of disturbance (motorboats, personal watercraft, people on foot), location of nest (high in trees, near edge of land, etc.), and level of habituation. A nesting bird exposed to a disturbance can "flush," or move away from its nest. A nesting bird that is startled off its nest can inadvertently crush and destroy the eggs in the nest. Similarly, if the disturbance results in a prolonged or permanent absence from the nest, eggs can be exposed to extreme temperatures that can result in death of the developing chicks.

Disturbances have led to egg and nestling mortality, premature fledging or nest evacuation, reduced body mass or slower growth of nestlings, and altered adult foraging patterns and/or reproductive behaviors (Rodgers and Smith 1995).

CLIMATE CHANGE

With respect to all species of concern, regardless of their listing status, climate change is expected to have profound effects on wildlife because their biological cycles are so closely tied to temperature and their habitat. Birds, mammals, insects, and marine species are most likely to be affected. Sensitive species such as the manatee and American crocodile, which already have a reduced habitat range, are especially vulnerable to the impacts of climate change. Bird migration patterns are already changing, with birds that winter in the southeast United States arriving on average 13 days earlier. Earlier breeding and egg-laying dates and range expansion are already being seen in a variety of bird species. Biscayne National Park is home to both migratory and resident bird species, some of which are tropical wading birds with habitat in areas likely to be affected by climate change.

Fish and other marine species are especially sensitive to changes in water temperature and chemistry. Disruptions in the life cycles of these species, especially breeding and egg laying, are already occurring. Disease outbreaks in ocean species, in part because of range expansion of marine parasites, are also occurring and are expected to increase as water temperatures rise. Sea turtle nesting sites are likely to be lost in areas with beach erosion and sea level rise (NPS 2009c) and vegetation shifts, such as from dunes to mangroves. Other documented impacts on predator-prey relationships and wildlife habitat in marine and terrestrial environments are already occurring, such as changes in the male/female ratio of sea turtles and amphibians (Loehman and Anderson 2009). Butterflies and insects are especially susceptible to minor changes in host plant availability and the timing of pollination, and they may experience major physiological disruptions with climate and habitat change (NPS 2009c).

SUBMERGED AQUATIC COMMUNITIES

The park encompasses a mosaic of submerged aquatic communities, including seagrasses, hardbottom, barebottom, and coral reef. The combination of these communities makes the area ecologically rich and biologically diverse.

The seagrass beds or meadows in Biscayne Bay cover about 72,000 acres, or about 42% of the park area. The seagrass beds provide shelter from predators, breeding and nursery areas for many fish, and forage for other species such as the manatee. The beds also

absorb nutrients from coastal and estuarine systems, stabilize substrates, and minimize the effects of wave action.

Seagrasses in the park include turtle grass (*Thalassia tesudinum*), manatee grass (*Syringodium* spp.), and shoal grass (*Halodule* spp.). Growth and distribution of seagrasses are controlled by light attenuation, photoperiod, temperature, salinity, and sediment type. These communities can be found in monocultures, mixed grass species, or in association with several species of algae. These habitat types comprise the major benthic plant communities in the bay and are highly productive (Thorhaug 1976). The seagrass is a primary food source for manatees. The root mass of these plants stabilizes sediments and their leaves create resistance to water currents and promote water clarity, tapping suspended sediments and providing habitat for a wide variety of benthic organisms. Species diversity and densities of organisms can be very high within seagrass beds. Numerous species of shrimp, crabs, worms, clams, snails, lobster, and echinoderms inhabit these areas (Milano 1983). Seagrass beds provide habitat for both small fish and larvae.

Currently, the greatest threats to the productivity of the seagrass beds are vessel groundings and scarring by motorboat propellers. Propeller scarring occurs when a boat traverses water that is too shallow for the draft of the boat. The propellers cut and pull out the grasses, leaving unvegetated furrows. The scars tend to widen over time because of erosion of the unprotected sediments and wave action. Repeated scarring can ultimately lead to completely denuded substrates and the subsequent loss of habitat and the degradation of water quality. Groundings have an even more severe impact on seagrass beds. In this case, a boater runs aground in the shallow water and tries to get free by force. This can cause blowouts in the substrate and suspend enough sediment to create water quality impacts in an area substantially larger than the area of physical impacts. The turbidity reduces photosynthesis in the seagrass beds, reducing productivity. The proposed noncombustion engine use zones are designed, in part, to protect seagrass beds from scaring and reduce localized turbidity, which in turn benefits the organisms that rely on the beds for food and shelter.

Hardbottom communities generally occur in the areas that have exposed rock and/or less than 6 inches of sediment. These communities consist primarily of sponges, alcyonarians, and various inshore corals. The dense hardbottom community characteristically has a greater diversity of soft corals, including a variety of large, attractive sea fans, sea whips, and related forms. These assemblages of soft corals and sponges, because of their size and density, provide an excellent refuge for fish and various kinds of invertebrates, including shrimp, crabs, worms, brittle stars, and sea urchins (Milano 1983).

Barebottom communities occur in areas where sediment depth, sediment quality, or water quality will not support the growth of seagrasses or corals. Organisms that live in these areas may include worms, mollusks, tunicates, nematodes, crabs, shrimp, amphipods, clams, snails, and sea cucumbers.

Coral reefs are among the most diverse and biologically complex ecosystems on earth. Reefs provide economic and environmental benefits to millions of people as areas of natural beauty and recreation and sources of food, jobs, chemicals, pharmaceuticals, and shoreline protection. Now under threat from multiple stresses, coral reefs are deteriorating worldwide at alarming rates. An estimated 10% of the world's reefs have already been lost and 60% are threatened by bleaching, disease, and a variety of human activities including shoreline development, water pollution, boat groundings, overharvesting, destructive fishing practices, and global climate change. Sustained downward trends in coral reef health suggest that these are areas that are in peril (United States Coral Reef Task Force 2000). Hurricane activity and slow coral regeneration rates, which vary with the intensity of a particular hurricane, can also

diminish overall coral cover (Gardner et al. 2004).

Biscayne National Park is important to the function and dynamics of the larger Florida reef tract because it provides important habitat for both larvae and juveniles of a diverse array of species. The adult organisms then migrate to the reef tract (Ault et al. 2001). In the park, the reef environment extends eastward from the keys out to outer edges of the coral reef tract. The salinities of the reef area are oceanic and have very little seasonal variability.

Coral communities are primarily found east of the keys. The coral communities can generally be broken into two types—the patch reef and the reef tract. Patch reefs typically are structures of living masses of coral. The patch reefs in the park range in size from an individual coral head to masses more than 150 feet across. The reef tract, or outer reef, is generally along the eastern boundary of the park. This reef consists primarily of dead coral rubble. Live coral lie mostly on the seaward side of the reef adjacent to deeper water and the Florida current.

The patch reefs are composed of living masses of coral heads rising directly from the bottom in water typically 10- to 20-feet deep. The coral heads tend to have nearly perpendicular sides and rise to within 2 to 3 feet of the water surface. The patch reefs range in size from individual coral heads to masses in excess of 150 feet across. The bottom around the reefs is usually flat and covered with seagrass. There typically is a bare sand halo around the reef, the result of grazing by fishes, especially parrot fish. These patch reefs provide habitat to a large variety of fishes and other marine life.

The reef tract is predominantly dead coral rubble, with live corals lying mostly along the seaward edge of the reef immediately adjacent to deeper water and the Florida Current. Two main outer reef types occur in the park. The first is represented by Long Reef, which is a long, low, shallow structure formed by loose coral rock and sheets of dead *Acropora* coral. Within this reef structure and beneath the rock slab exists a wealth of marine life. The second type, represented by Ajax Reef, is largely made of live *Millepora* coral colonies.

Biscayne park staff have noted that careless boaters have a dramatic effect on coral reef resources. They estimate that there are 20 to 30 significant boat groundings on coral reefs each year, each damaging 10 to 100 square feet of coral reef.

Commercial and recreational fishing is also taking its toll. Commercial and recreational fishing gear tangles on the reef, breaking branching corals and smothering boulder corals. Fishing also disrupts the natural food web resulting in imbalance and loss of species, including those that normally would control algal growth on reefs. Improperly placed anchors tear up the reef by breaking coral free of the reef, increasing the potential for mortality by smothering. Other anchors, even if properly placed, tear up seagrasses when removed, destroying forage used by a spectrum of coral reef organisms.

Scuba diving can also impact coral reefs through careless or deliberate contact between divers, their gear, and the corals (Hall 2001). Studies have found that some scuba diving impacts can be reduced with educational messaging (Medio et al. 1997) and in-water supervision (Barker and Roberts 2004).

It is currently impossible to determine the impact that pesticides, herbicides, heavy metals, and pharmaceuticals are having on the biotic resources of coasts and coral reefs. Generally, these dissolved pollutants are found at very low concentrations in our coastal waters. There are no established water quality standards for marine systems. In lieu of established standards, federal and state regulators are forced to use water quality standards established for terrestrial aquatic (freshwater) systems as the acceptable reference level for marine pollution. Most of these standards have lower limits 1–5 parts per

billion (micrograms per liter); however, there is some indication in the literature that marine organisms, especially plankton, are affected by chemical pollution at the parts per trillion level, three orders of magnitude lower. Both hard and soft corals, sponges, and some fish are planktivores, and many other members of the coral reef community feed on coral, sponges, and fish—thus providing the mechanism for magnifying low pollutant concentrations into serious levels in the upper food chain.

Reef-building corals have temperature tolerances that are now being approached; some corals will probably exceed their temperature tolerance because of climate change (Florida Oceans and Coastal Council 2009). Incidences of disease and coral bleaching are also higher with increased acidification and temperature of ocean waters. Because sea waters rise faster than coral reefs are built, the reefs would effectively be in deeper water, resulting in less light (and reduced photosynthesis) for the reefs and their inhabitants. Also, predicted ocean acidification will reduce the availability of calcium carbonate that is used in reef building, and this could result in decreased growth and skeletal density (NPS 2009c). Lower species diversity in coral reefs that are already disturbed or compromised will also make them less resilient to climate change (EDF 2008). Similarly, ocean acidification can affect marine ecosystems by altering the planktonic base of the food web. Waterbirds, among other fauna, will likely be affected at a global scale by reducing production of their direct prey or reduction in the base of their food webs and habitat such as coral and oyster reefs (Ogden et al. 2014).

Even international shipping well outside territorial waters has impacts on coral reefs by jettisoning weighted garbage and dunnage (packing material such as wood, rope, or inflatable bags) over the side. Much of the discarded dunnage floats, and some of the jettisoned garbage containers break up and release plastics and other buoyant material to float to the surface. Both are then carried by currents throughout the world. Researchers have even used the cargo released from sinking ships to determine oceanic current patterns. In 1988, the park estimated that the rate of garbage and dunnage accumulation on the seaward shorelines was in excess of 2 pounds per square meter per day.

Climate change is predicted to cause increased water temperature, decreased dissolved oxygen content, and increased nutrient and pollutants in the water column. This would impact seagrasses and hardbottom and barebottom communities by reducing light and impacting photosynthesis and community dynamics. Seagrass die-offs are expected to increase with increased water temperature (Florida Oceans and Coastal Council 2009). Changes to marine invertebrate habitat and community dynamics are also likely because of increased sea water temperature and light attenuation (NPS 2009c).

TERRESTRIAL VEGETATION

Tropical coastal hardwood hammocks are found on many of the park's islands. Hammocks are evergreen, broad-leaved forest composed predominately of trees common to the Bahamas and Greater Antilles. The canopy is typically 29–39 feet (9–12 meters) tall with gumbo limbo, pigeon plum, wild tamarind, willow bustic, Jamaica dogwood, mastic, and strangler fig as common trees. The subcanopy contains white stopper, Spanish stopper, crabwood, torchwood, wild coffee, and marlberry. Hammocks are typically abundant with epiphytic plants, including orchids, bromeliads, and ferns. A mature hammock has relatively open understory. As the elevation slopes toward sea level, halophytic (salt-tolerant) plants such as buttonwoods become more dominant.

Hurricane Andrew, a compact but very intense storm, made landfall as a category 5 hurricane on August 24, 1992. The eye of the storm passed through Biscayne National Park, Everglades National Park, and Big Cypress National Preserve, with a forward speed of

about 32 mph and maximum sustained winds of 150 mph. Vegetation was affected in a 31-mile swath. In Biscayne this swath was observed from Old Rhodes Key on the south to Sands Key on the north. The effects of the hurricane on the hammock forest on Elliott Key were dramatic. Large trees were extensively damaged—with 20% to 30% downed and nearly 100% having large branches sheared off. Much of the canopy and subcanopy were defoliated. (NPS 1996a).

Climate change is expected to affect the vegetation composition in the park, especially in the mangroves and other areas where changes in sea level may alter the water table or soil characteristics. Air temperature in Florida is predicted to increase, with average low temperatures in winter increasing by 3.1 degrees Fahrenheit (°F) to 10.1°F, and average high temperatures increasing by 3.1°F to 7.0°F by 2100. These changes are expected to alter species composition in the park because species requiring cooler temperatures move northward. Storm surge and altered flooding regimes, from overwash as well as groundwater, are expected to alter soils, leading to potential changes in the terrestrial plant communities.

Components of the unique plant assemblage that represents the interface between the subtropical and temperate zone may shift northward. Plant-animal interactions such as pollination, seed dispersal, and insect control may be disrupted. Invasive species are also expected to expand their ranges because of altered precipitation and temperature regimes (Loehman and Anderson 2009).

WETLANDS

Wetlands are found along the coast of the mainland and the fringes of the keys and are an important ecosystem. Wetlands provide natural filtration of waters as they enter the park and habitat for a variety of aquatic and terrestrial species. Historically, the mainland coast of southern Florida was predominantly wetlands. Changes in land use and modifications to natural drainage patterns have dramatically reduced the amount of wetlands in the region, and today the three national park system units (Biscayne, Big Cypress, and Everglades) contain some of the last wetland areas in South Florida.

The wetlands in the park are predominately mangrove forest. The vegetation is a combination of buttonwood and red, white, and black mangroves. These coastal mangrove areas provide important nursery areas for many marine species. The heavy vegetation provides refugia for larval and immature stages of a host of species. The mangroves also provide roosting and nesting sites for several species of birds such as herons, egrets, and songbirds. The mangroves also provide habitat for the endangered American crocodile.

Expected changes in air and water temperatures in Florida because of climate change is predicted to alter the nutrient cycling in wetland areas of Biscayne National Park because temperature has a marked effect on the biogeochemical processes in those shallower wetland and salt marsh areas. Freshwater wetlands are likely to be inundated by saline water as warmer ocean waters rise, causing landscape-scale changes to these ecosystems and detrimental impacts on freshwater resources (NPS 2009c). Salt marshes may have some resilience to sea level rise, especially if new sedimentation rates are roughly equal to the rate of sea level rise. However, localized impacts on salt marshes could occur depending on the rate and type of changes. Additionally, shifts in water temperature may have dramatic impacts on the acidity (pH) of wetlands, which could cause a cascade of effects in oxygen content, nutrient cycling, and associated vegetation and wildlife, including coral. Estuaries and smaller bay areas along the keys are especially vulnerable to these types of water temperature changes (Loehman and Anderson 2009).

SOUNDSCAPES

The natural soundscape in a park system unit is defined as its mix of ambient acoustic conditions without the intrusion of human-caused sound. The soundscape is a resource associated with the natural settings and conditions found in a park. A healthy natural soundscape is critical to the enjoyment of a park by visitors and to some natural biological processes that are part of a park's ecosystem.

Preservation and restoration of the natural soundscape has become a foremost challenge in the protection of national park system resources. Biscayne National Park offers some of the best places to hear a "symphony" of natural sounds, including the calls of wildlife and the melodies of wind and water that together form a rich natural resource that is important to the park's ecological communities. Today, these natural ambient sounds are threatened as the human-produced noises increasingly intrude into even the most remote corners of the park.

Natural ambient sound is the sound created by processes in the natural environment, and it may include a combination of sounds created by wind, flowing water, crashing waves, thunderstorms, animals, birds, insects, vegetation rustling in the wind, and other biological and physical components. The opportunity to experience natural sounds is an enjoyable part of the visitor experience for many in the park. In considering natural ambient sounds as a resource, the ability to clearly hear the quieter intermittent sounds of nature for extended periods of time is an important consideration in Biscayne's soundscape management.

In 1997, Biscayne National Park staff was concerned about noise management because of the proposed transfer of portions of the former Homestead Air Force Base to Metropolitan Dade County for development as a major commercial airport. Eventually, this concern led to broader questions about the relationship of all sounds, natural and human-caused, to the purposes for which Congress established Biscayne National Park.

Biscayne National Park Soundscape Characteristics

The natural sounds (transmitted through air) that make up the ambient sound environment or soundscape of Biscayne National Park consist of a combination of one or more of the following—wind, insects, animal vocalizations, flowing water, thunderstorms, and vegetation rustling in the wind. Several studies have found that the ambient sound levels vary with wind and the local ground cover. The natural sounds are related to the type of nearby vegetation, the population of wildlife that is drawn to the vegetation, and the interaction of the wind with the vegetation.

The character of the sound level or loudness of wind flowing through the foliage of mangrove trees and other vegetation depends primarily on the wind speed and sometimes on wind direction. Lapping water on the shore and through mangrove roots is another characteristic element of the soundscape. The loudness primarily depends on the tides, wind speed, and wind direction. Animal sounds, including insects, and bird calls, are common in the park. Thunderstorms and heavy periods of rain are frequent characteristic sounds, especially during the summer.

Many other natural intermittent sounds can be heard in the national park that can infuse humans with a feeling of peace and tranquility. Along the mangrove fringe, one can hear the occasional slap of a leaping mullet, the snort of a manatee, or the call of an osprey or heron. While scuba diving or snorkeling on the reefs, visitors can hear parrot fish feeding on coral or the sound of shrimp clicking their claws together. While sitting on a boat near the reef one commonly hears the sound of wind and waves and sometimes the call of a seabird or even the slap of a dolphin's fluke.

The high density of water compared to air allows sounds to travel farther and faster underwater than above. Whale calls, for example, are occasionally detected between oceans, and the U.S. Navy uses sound to detect distant submarine operations. If one listens, it is very noisy underwater, and the detection of sound (i.e., pressure) is very important to most marine organisms. Fish have lateral lines that detect minute changes in pressure to avoid predators. Invertebrates, such as the snapping shrimp (*Alpheus heterochaelis*) and pistol shrimp (*Alpheus randalli*) use loud, sharp sound to immobilize or stun prey. Natural underwater sounds vary widely in purpose, frequency, and duration. Human-caused sounds are often louder than natural sounds. How these sounds affect the natural environment is largely unknown. However, a few brief experiments in Biscayne National Park have demonstrated that human-caused underwater sound, especially high frequency sound, increases several orders of magnitude during weekends because of the marked increase of recreational boating during that time.

Human Sound Impacts on Soundscape Resources

Sound pressure levels are commonly measured in units called decibels (dB). The human ear is not equally sensitive to all sound frequencies, being generally less sensitive to very low and very high frequency sounds; therefore, the A-weighted decibel scale (dBA), which is calibrated to the human ear's response, is often used when analyzing impacts.

For the average human a 10-dBA increase in the measured sound level is subjectively perceived as being twice as loud, and a 10-dBA decrease is perceived as half as loud. The average human with normal hearing can detect a 1 dBA change in sound levels if listening attentively; however, generally, a change of 3 dBA is noticeable. There is generally a 6-dBA reduction in sound level for each doubling of distance from a noise source.

Many factors affect how an individual responds to noise. Primary acoustical factors include the sound level, the distribution of sound levels across the frequency spectrum, the duration of the sound, and other factors. Each of these factors is sensed relative to the ambient soundscape that exists without the specific noise under consideration.

Nonacoustical factors also play a role in how an individual responds to sounds. Such factors vary from the past experience and adaptability of an individual to the predictability of when a noise will occur. The listener's activity will also affect their response to noise.

Biscayne National Park noise management issues and concerns can be categorized as noise related to (1) park operations and concessions, (2) visitor and commercial activities, and (3) other intruding sources from outside the park. Noise concerns have been identified through an internal and a public scoping process during which participants were asked about impacts on their quality of experience at the park. Although not representative of all visitors, a diversity of opinions on the noise issue has been provided. Identified intrusions include noise from idling tour buses, boat engines, military overflights, and audio devices at mooring areas. In addition, many surveys have shown that opportunities for quiet and solitude and hearing natural sounds have been mentioned as important indicators of quality visitor experience. Park users consistently state that escaping noise and enjoying the sounds of nature are among the most important reasons why they visit natural areas.

Identification of intruding noise sources impacting the Biscayne National Park soundscape or the experience that the park is intended to provide include the following:

Convoy Point

- air-conditioners
- idling buses
- slamming car doors
- audio devices
- aircraft overflights

maintenance machinery
park communication radios
concession boats
boat engines

Elliott Key
boat generators
boat engines
air-conditioners
audio devices
generators
maintenance machinery
aircraft overflights

Adams Key
boat engines
generators
aircraft overflights

Boca Chita Key
boat generators
boat engines
air-conditioners
audio devices
aircraft overflights
generators
maintenance machinery

Tidal Creeks and Shallow Waters between Old Rhodes Key and Totten Key

boat noise (especially for sensitive wildlife species)
aircraft overflights

Central to Eastern Biscayne Bay
aircraft overflights
boat engines

Intracoastal Waterway
high-performance boats
barges

Coral Reefs / Submerged Cultural Resources
Noise concerns near the coral reefs include the quality of the visitor experience while enjoying fishing, snorkeling, and scuba diving as well as resource concerns for the integrity of shipwreck sites and associated biota. Research indicates that underwater noise can have a detrimental effect on marine biotas, particularly marine mammals. Cumulatively, the effect of intrusive noise, when combined with other environmental stressors, can cause degradation of resources and decrease visitor enjoyment.

Baseline Natural Ambient Soundscape Information

"The Soundscape in South Florida National Parks," a study prepared by Wyle Laboratories in June 2000, provided a detailed reanalysis of the field data gathered to date and developed general procedures for measuring the natural ambient soundscape. The primary goal was to take sound measurements in South Florida parks (Biscayne, Big Cypress, and Everglades) and describe the natural soundscape of the parks. Whereas previous studies involved sound-level monitoring with manned observations over relatively short time periods of 1 to 3 hours in which all natural and intruding sounds were identified, this study evaluated the use of unmanned monitors to extend measurement of the natural soundscapes to several days. Results from unmanned measurements were compared to previous manned studies and methods for quantifying the natural soundscape and the effect of intrusions were determined.

The sound levels for the season of the study (June 1999) exhibited a diurnal pattern with the highest natural sound levels occurring mostly at night and the lowest sound levels during the day. Future monitoring will look at seasonal variations in sound levels. The higher sound levels at night correspond to the increase in insect activity; the sound levels rise and remain mostly constant over the nighttime period, which would be consistent with insect sounds. Conversely, the study found that intruding transient sounds increased during the day and decreased at

night. This makes intuitive sense as well because visitors and human-generated noise increases during daylight hours.

Past studies have used various metrics to describe, in qualitative terms, the baseline sound level at parks throughout the park system. The Wyle report helped refine metrics and standards concerning baseline data. The report indicates that the L90—the sound exceeded 90% of the time—is a reasonable approximation of the natural ambient sound levels and furnishes a basis for determining intrusive event threshold levels. The most accurate method of determining natural ambient sound levels is to physically remove all human-caused sounds and calculate the median of those data without human-caused sounds. Research has shown that the L90 is a reasonable estimate of natural ambient sound levels.

For sites monitored in Biscayne National Park, the A-weighted sound levels due to natural sources were reasonably consistent over the region for the time period studied. The average 24-hour L90 for all the sites was 33 dBA. Quantitatively, the protected shorelines, such as the mangrove shoreline of the mainland and mangrove-dominated keys, were the quietest sites. Characteristic zones were monitored to test the hypothesis that characterizing the natural sound of the South Florida sites could be accomplished based on acoustic zones. Representative zones included open water, forest on a key, key shoreline, shoreline mangrove key, and developed area. Although the Wyle study concluded that the natural ambient soundscape is fairly constant over the South Florida parks for the season and period of time monitored, it reported differences in day and night levels due to insects.

Biscayne National Park is an important habitat area for migrating birds to stop and rest or feed before they continue their journey. Behavior disruption from human-caused noise intrusions is particularly applicable to migratory and nesting birds. The National Park Service, which participates in the Partners In Flight Program, has identified loss, fragmentation, and quality of habitats for migratory birds worldwide as a serious problem.

The following areas contain species of concern that potentially could be sensitive to noise impacts in and near Biscayne National Park:

1. Some of the most environmentally sensitive lands in the national park that provide wildlife habitat are in and around the park's western shoreline. This area contains some of the only remaining true natural area in all of the Florida Keys. The area in and around Jones Lagoon, including Totten Key, Little Totten Key, and Old Rhodes Key, is virtually undisturbed and has had little human-caused influence (other than some historic agricultural operations). This area also includes the entire mainland shoreline of the park (excluding Black Point, Convoy Point, and Turkey Point), the Arsenicker Keys, and Mangrove Key.

   Sensitive habitats in this area (the park's western shoreline) include rookeries for several species of wading birds, and the marine and wetland environments provide habitat for rare species. Also, the waters adjacent to the park's mainland shoreline are nursery grounds for a number of commercially important fish and invertebrates that serve as a food source for birds.

2. The national park consists primarily of marine environments but also includes some significant upland areas such as Elliott Key. Sensitive habitats in the park provide important migratory habitat.

3. Areas of the national park that are heavily impacted by humans include Hawk Channel and the Intracoastal Waterway (heavy boat traffic areas for visitors who may or may not use other park resources), channels dredged for boat traffic (Convoy Point, Black Point, and Turkey Point, and Biscayne Channel) for visitors who use park

resources, and Stiltsville. Most species use these areas sparingly or while traveling through the region. Certain species, including crocodiles, manatees, shorebirds, wading birds, and migratory raptors and passerines, use these areas.

4. The reefs in the park are heavily used by commercial and recreational anglers of all types, by pleasure boaters, and by scuba divers and snorkelers. Thus, the number of human-caused disturbances is potentially high. Fish and other marine vertebrates may feel impacts from increased noise levels.

5. Animals in the developed areas of the national park, such as Convoy Point, Elliott Key Harbor and camping area, Adams Key residence area, and Boca Chita Key day use and camping area, generally only use the peripheries of these areas or pass through them. Some species that may be encountered in these areas, including wading birds, land birds, and shorebirds; river otters; marsh rabbits; bobcats; indigo snakes; and other common snakes, may be impacted by noise from aircraft overflights.

Culturally Sensitive Areas

Cultural resources in Biscayne National Park are rich with examples of the international maritime heritage that has shaped the history of southeast Florida and the Caribbean region. There is potential for concern involving the degradation of the park's cultural resources that may occur to historic buildings and underwater archeological remains from the effects of vibration from aircraft and/or motorboats. Sound from aircraft activity can cause archeological resources, structures, and museum objects to vibrate. Depending on the character of the sound, the effects range from an audible rattle to items "walking across surfaces," to fatigue cracking, and potentially to direct or indirect structural damage. Potential for impacts depends on the relationship of the aircraft overflights to the resource, the frequency of overflights, and the frequency-dependent responses of the resource to impinging sound waves.

CULTURAL RESOURCES

INTRODUCTION

Biscayne National Park contains significant cultural resources that are associated with human activity from prehistoric times to the present. These resources include archeological resources, historic buildings and structures and sites, and cultural landscapes. Human activities have occurred on and around the mainland, keys, and waters of Biscayne Bay for some 12,000 years. These activities are associated with American Indian habitation, land use, and subsistence, and with European American exploration, settlement, and socioeconomic development, including fishing, citrus agriculture, and recreational development (Leynes and Cullison 1998; NPS 1999).

TYPES OF CULTURAL RESOURCES

The National Historic Preservation Act of 1966, as amended, recognizes five cultural resource property types: districts, sites, buildings, structures, and objects. As called for in the act, these categories are used in the National Register of Historic Places, the preeminent reference for properties worthy of preservation in the United States. To focus attention on management requirements within these property types, NPS *Management Policies 2006* categorize cultural resources as archeological resources, cultural landscapes, structures, museum objects, and ethnographic resources. (Museum objects and ethnographic resources were dismissed as impact topics for this general management plan.) Director's Order 28: *Cultural Resource Management* provides definitions for the aforementioned cultural resource types

Archeological resources are the remains of past human activity and records documenting the scientific analysis of these remains. Archeological features are typically buried but may extend aboveground or be under water; they are commonly associated with prehistoric peoples (resources that predate the beginning of written records), but may be products of more contemporary society (resources that postdate European American contact with American Indians). What matters most about an archeological resource is its potential to describe and explain human behavior.

Cultural landscapes are settings that people have created in the natural world and that reveal fundamental ties between people and the land. Landscapes—geographic areas that exhibit evidence of human habitation and intertwined patterns of things both natural and constructed—constitute special places that are expressions of human manipulation and adaptation of the land.

Structures are material assemblies that extend the limits of human capability and constitute elaborations of human productive ability and artistic sensitivity. Structures—prehistoric and historic—include buildings, roads, vessels, fences, and other assemblies of historical, aesthetic, or scientific importance.

HISTORICAL OVERVIEW

Prehistory

The prehistoric cultural history of South Florida is generally divided into three time periods. The first period is referred to as the Paleo-Indian, extending from about 13,000 to 8,000 BP (before present). Archeological evidence indicates that the earliest inhabitants of southern Florida lived in a marine-terrestrial environment that differed considerably from present-day topography. During the Paleo-Indian period, sea levels were considerably lower than at present, and Biscayne Bay was a freshwater marsh ringed

by limestone hills of the present-day keys and the low ridge that forms the current eastern Florida coast. In addition, paleontological studies indicate that the climate was considerably drier, and that the predominating vegetation types along the eastern Florida coast were savannah and dune scrub interspersed with more lush vegetation along watercourses (Sears and McGregor 1973; Leynes and Cullison 1998; NPS 1999).

Because of environmental conditions in southern Florida, little cultural evidence, other than lithic tools and the sites where they were manufactured, survives to illustrate the Paleo-Indian period. The people who inhabited Florida at that time appear to have been organized in small groups of mobile hunters and gatherers, using areas where a steady water supply, good stone resources for tool making, and firewood were available. Although the cultural remains associated with the Paleo-Indian period consist almost entirely of lithic artifacts that exhibit a generalized subsistence pattern, the presence of large, lanceolate projectile points suggests that this cultural group hunted now extinct Pleistocene megafauna such as the saber-toothed tiger and giant armadillo. The stone tool tradition among Paleo-Indians along the Florida coast includes high-quality chert projectile points.

Around 12,000 years ago, warmer temperatures prompted a rise in sea levels as glacial polar ice caps melted. As the sea levels rose, many of the terrestrial American Indian sites in South Florida were inundated. On Florida's western shoreline, underwater surveys in Apalachee Bay have found six submerged sites as far as 6 miles offshore. Deep sinkholes in Sarasota County (Warm Mineral Spring and Little Salt Spring) have also yielded data about Paleo-Indian life. Nearer the keys, the Cutler Fossil site on Biscayne Bay has yielded radiocarbon dates as early as 10,620 ± 120 BP.

The Archaic period (9500 BP–2500 BP) followed the Paleo-Indian and was marked by the continued rise in sea levels. As the climate gradually became wetter, people expanded their areas of settlement to coastal areas and along inland rivers. This period featured the beginnings of larger settlements, group burials, and the introduction of ceramics. During this period, water from the Gulf of Mexico began flowing over the lower elevations of the Florida peninsula, inundating the southeastern Florida coastline and filling in Biscayne Bay. The low offshore limestone hills were almost covered by the rise in sea level—the summits of these hills are visible today as the Florida Keys. By 4000 BP, the southern Florida shoreline was similar to present-day topography. In general, most Archaic sites in Florida are found in the interior highlands, St. Johns River valley, the Everglades, and along the Atlantic, southwest, and panhandle coasts as well as the Gulf Coast near Tampa. The rise in sea levels undoubtedly flooded coastal sites in South Florida's lowland areas and shorelines that had been inhabited during the first 5,500 years of the Archaic period. Thus, it is likely that Archaic period sites not in upland areas are now submerged, some possibly within Biscayne Bay.

The third period of prehistoric occupation—generally known as the Formative period—began about 2500 BP and continued until European American contact in AD 1513. In southern Florida, this period is defined by archeologists as the Glades Tradition, which is distinguished by a typology and relative chronology of ceramics defined by changes in ceramic decorative motifs. Seven periods comprise the Glades chronology:

1. Glades I Early (2500–1500 BP)
2. Glades I Late (1500–1250 BP)
3. Glades IIa (1250–1100 BP)
4. Glades IIb (1100–900 BP)
5. Glades IIc (900–800 BP)
6. Glades IIIa (800–600 BP)
7. Glades IIIb (600 BP to European American contact in AD 1513)

Archeological evidence of the Glades periods includes a variety of lithic tools and

ornaments that indicate the peoples living along the southeast Florida coast had developed a thriving trade network. During this period, people concentrated in river valleys and along the coast, built earth mounds for burials, engaged in expanding long-distance trade networks, and developed rudimentary agricultural plant cultivation and harvest practices. All of the currently known prehistoric sites in Biscayne National Park fall within the Glades Tradition; however, some include evidence of interaction with Europeans during the later Contact period.

History

When Juan Ponce de Leon first landed in Florida in 1513, he claimed the land for Spain. The Spanish encountered a thriving American Indian population consisting of at least five separate tribes:

Tequesta in southeast Florida
Calusa in the southwest
Jobe and Ais along the east coast north of the Tequesta, and the
Mayaimi near Lake Okeechobee

Conservative estimates place the Indian population prior to European American contact at 25,000. The Calusa maintained political dominance over the Indian groups of southern Florida. During the early historic period, the peoples inhabiting the area currently in the boundaries of Biscayne National Park were referred to as the Tequesta (Tebeau 1971).

The Tequesta practiced small-scale horticulture on the rich lands north of the park where they grew corn, beans, and squash and fished and hunted along the southeastern coast. Villages were situated at the mouth of the Miami River and along the coastal islands. Although the Tequesta supplemented their diet with garden vegetables and meat, such as bear, deer, and wild boar that were hunted in the Everglades, resources found in their immediate marine environment formed the major portion of their diet. The abundant wildlife and marine life, as well as the mild climate, encouraged political and economic stability in Tequesta society, which was organized into villages controlled by village chiefs and religious leaders (McNicoll 1941).

The geographic relationship of Florida to the Florida Straits and Gulf Stream made the southeastern Florida coastline strategically important to Europeans interested in controlling, or at least exploiting, popular shipping routes from the Caribbean and South America to Europe. Following the discovery of the Gulf Stream and its northward currents by Ponce de Leon in 1513, the Spanish quickly recognized the geographic significance of Florida. Thus, they were the first European Americans to colonize Florida, and they began constructing forts and Roman Catholic missions. Spain claimed most of the present-day southeastern United States during the early period of European colonization, but because nothing as valuable as the gold and silver of Mexico and South America was found, the area was used primarily as a buffer to protect Spanish holdings farther south.

Although the Spanish may have landed on the keys that are now in Biscayne National Park, the area's water routes were their primary concern. Almost all ships returning to Europe used the Gulf Stream to expedite their voyages, and because the Florida Keys are on the Gulf Stream, most ships using this route would have passed the keys. Many of these ships were laden with precious metals from the New World.

The Florida Keys were not occupied and little explored; however, the sinking of the Spanish Plate Fleet in 1733 and attempts at its recovery brought about the exploration and naming of the principal keys. Although the derivation of the Biscayne name is uncertain, the bay may have been named for the Bay of Biscay between Spain and France or a Spaniard by the name of Vixcayno may have lent his name to the bay. The term "key" derives from the Spanish word *cayo*, meaning islet or small island.

French and British exploration of Florida began in the 16th century, with French explorers penetrating northern Florida from the west via the Mississippi River and the British expanding their colonial boundaries south from Georgia. Despite these incursions and the brief period of British rule from 1763 to 1784, the Spanish retained control of Florida until 1821.

With the arrival of the European Americans, the culture of the southeastern American Indians changed abruptly. One of the first effects of contact for American Indians in Florida was the introduction of diseases by Europeans and enslaved Africans. By 1700, it is estimated that the American Indian population of Florida may have been reduced by as much as 90% due to outbreaks of smallpox, mumps, measles, influenza, and pneumonia, against which the natives had no defense. By 1763, when the English gained control of Florida, the Indian population had been reduced to only several hundred people. Much of this remnant population is thought to have migrated to Cuba with the Spanish when the British and later the Americans took control of Florida.

Following the decline of the Tequesta population, Creek Indians from Alabama and Georgia moved into Florida. Groups of Lower Creeks moved to Florida to get away from the dominance of the Upper Creeks, and other Creeks searched for new agricultural areas for planting corn, beans, and other crops. For some years, Spain encouraged these migrations to help provide a buffer between its Florida settlements and the British colonies. Thus, Spanish Florida became a refuge for Creek Indians.

During the brief period of British rule in Florida between 1763 and 1784, the Indian population of Florida consisted of several groups, primarily the Creeks and the Miccosukees. The population also increased by runaway slaves who found refuge among the Indians. Smaller Indian groups included the Yamasses and Yuchis and several other aboriginal remnants. The British called the people of Creek Indian descent "Seminoles," a name probably derived from the Spanish word cimarrones, meaning "rebel" or "outlaw" and commonly used by the Spanish to identify American Indians and in a similar derivative, maroon, meaning runaway slaves.

During British rule, Florida was divided into two colonies—East Florida and West Florida. The British government surveyed most of the Florida Keys in 1774.

No permanent European American settlements were established on the Florida Keys when the United States assumed control of Florida in 1821. Thereafter, the largest group of whites to settle on the keys was mariners from the Bahamas. Known as "Conchs," these people were descendants of British patriots who fled to the Bahamas during the American War for Independence. By 1870, the population of the Upper Keys was about 130, and most people were inhabiting Key West. Although the keys were covered with hardwood hammocks and had little arable soil, some early settlers familiar with coral island farming techniques attempted to cultivate lands on the keys (Gannon 1996; Tebeau 1971; NPS 1999).

Marine Casualty Salvage (Wrecking). Flowing north between Cuba and the Florida Keys at between two and four knots, the Gulf Stream maintains a width of about 40 to 50 miles. This wide column of water eases the eastward progress of ships; however, the adjacent Florida Reef near the keys presents a marine hazard that has caused numerous shipwrecks. Two of the most significant wrecks in Biscayne National Park are the *Nuestra Senora de Populo*, a Spanish galleon wrecked in 1733, and the HMS *Fowey*, a British warship that ran aground and sank in 1748 (Skowronek and Fischer 2009). Because of the proximity of the keys, indigenous American Indians and early settlers on the islands became adept at salvaging the numerous marine casualties. Early populations of indigenous American Indians undoubtedly profited from salvaging

the spoils of shipwrecks, and by the 1700s, the salvage of marine shipping accidents (known locally as "wrecking") had developed into an industry that dominated the economy of the keys until about 1890. Because wrecking was a sporadic activity, people engaging in this industry also pursued other work such as fishing, sponging, or farming, which enabled them to maintain a presence near the ocean shipping route in the Gulf Stream.

On July 4, 1823, the Territory of Florida passed a wrecking act that required salvagers of wrecked property to report the salvage to the nearest public authority and established procedures for ascertaining ownership and compensation. To prevent the cargo from ships wrecked within U.S. jurisdiction from being adjudicated in foreign ports, Congress passed the Federal Wrecking Act of 1825, which required property from marine casualties in U.S. waters to be brought to a U.S. port of entry. In 1828, the United States established a Superior Court with maritime and admiralty jurisdiction in Key West. The building of lighthouses and development of other aids to navigation in the late 1800s gradually brought the wrecking industry to a close. The introduction of steam-powered and mechanically driven ships, which were much more maneuverable than wind-driven vessels, also contributed to the decline of the wrecking industry. The Wrecking License Bureau of the federal court closed in 1921.

American Jurisdiction and the Seminole Wars. In 1783, at the conclusion of the American War for Independence, Florida was returned to Spain. With reestablishment of Spanish control of Florida in 1784, Spanish colonists returned. The influx of settlers to Florida from the newly established United States grew at an even greater pace with Florida being increasingly populated with American settlers. As Florida's population increased, conflict between the Seminoles and European American settlers escalated. American settlers wanted to gain control of Indian lands and wanted their escaped slaves returned. After several official and unofficial U.S. military expeditions into the territory, Spain formally ceded Florida to the United States in 1819 under the Adams-Onis Treaty, although transfer of flags did not occur until 1821. The Creeks and proto-Seminoles had been in the area as early as the 18th century, and during the three Seminole Wars (1817–1818, 1835–1842, and 1855–1858), independent bands of Florida Indians established themselves in the Everglades to avoid removal from Florida. Known locations of Seminole land use near the Biscayne National Park area include a battle site dated to the Second Seminole War just north of the park at Key Biscayne and a Seminole trading post north of the park near Matheson Hammock.

Modern Seminoles are divided into two groups along linguistic lines. The Muskogee-speaking Seminoles reside on the Big Cypress Reservation, Brighton Reservation near Lake Okeechobee, and Seminole Reservation near Hollywood, Florida. The Hichiti-speaking Miccosukees live on the Miccosukee Reservation near the Big Cypress Reservation and in several small towns along and near the Tamiami Trail (Covington 1993).

Agriculture on the Keys. The keys, covered with hardwood hammocks and little arable soil, did not provide a likely place for agriculture; however, subsistence farming was practiced on the keys from the time of the earliest settlers. The first attempts to produce marketable commodities occurred during the 1850s. Crops, including pineapples, tomatoes, Irish potatoes, cassava, beets, carrots, turnips, and various tropical fruits, were raised with varying degrees of success.

Pineapple was the first successful crop to be grown in the keys. By 1890, growers had established pineapple plantations throughout the keys; the largest on Elliott Key. The keys produced all of the pineapple grown in the United States until about 1884 when the crop was introduced to mainland Florida locations (Niedhauk 1969).

After the decline of the pineapple industry, residents of the keys developed a lime

industry. The first lime trees on the Florida Keys had been introduced from the Yucatan region of Mexico by Henry Perrine in 1838. The Mexican lime (*Citrus aurantifolia*), popularly known as the key lime, would become the essential ingredient for making Florida's famous key lime pie. Although lime production peaked in 1923, a devastating hurricane in 1926 damaged most of the lime groves on the keys and the industry never recovered.

Elliott Key was the center of the agricultural efforts on the Biscayne Keys. At the peak of pineapple production, Elliott Key had a population of about 90. Pineapples were grown on the bay side of the key, and Elliott Key residents, like their neighbors on other keys, supplemented their income by salvaging wrecked ships and fishing. One of the earliest homesteaders to farm on Elliott Key was Asa Sweeting, who emigrated to Key West from the Bahamas in 1866. He claimed a 154-acre homestead at the northern end of Elliott Key in 1882. After obtaining additional acreage in 1896, the Sweeting family developed a substantial pineapple plantation and also planted lime groves and other crops. Typical of other farmers and settlers on the keys, the Sweetings (the last member of the family left the key in 1930) also engaged in coastal trading of merchandise and produce and salvaged shipwrecks (Niemiec and Mattick 1997).

Another Elliott Key settler was Israel Lafayette "Parson" Jones, a black settler who arrived in the area in the late 1800s. Parson Jones and his family owned and operated a lime and pineapple plantation on Totten Key. Jones made significant contributions to Miami's black community and ran a successful agricultural-based business for many years. Lancelot Jones, the last descendant of the family, lived on Porgy Key until Hurricane Andrew forced his evacuation in 1992 (De Gale 1997; Gilpen n.d.; NPCA 2010).

Various factors contributed to the demise of agricultural enterprise on the keys. These included the lack of deep water access, inadequate transportation for timely shipping of perishable foods, frequent storms and hurricanes, lowering of the water table, and infertility of the thin soil. By 1935, the viability of commercial farming on the keys had weakened, and the amount of acreage under cultivation was considerably reduced.

Recreational Development of Biscayne Bay. The development of Henry M. Flagler's Florida East Coast Railway in 1896 opened southeastern Florida to commerce and travel. Flagler was a prominent businessman from the Midwest with considerable assets from business ventures in grain, distilleries, and petroleum. Flagler purchased and rebuilt a short-line railroad between Jacksonville and St. Augustine during the 1880s to provide improved access to two hotels that he had built in the latter town. This railway, known as the Florida East Coast Railway, was soon extended to the south, and in 1896 it reached Miami, then known as Fort Dallas. War with Spain in 1898 and construction of the Panama Canal during the early 1900s enhanced the significance of the Caribbean, Cuba, and South America in the consciousness of the U.S. public (Gannon 1996).

Prospects of the profits to be gained by participating in the commerce of the Caribbean encouraged Flagler to consider an extension of the railroad across the arc of the Florida Keys. In 1902, survey work for the railroad project began, and construction started in 1905. Although halted by hurricanes in 1906 and 1909, the project was completed to Key West in 1912. The Florida East Coast Railway route to Key West operated for 23 years before its tracks and bridges were demolished by a severe hurricane in 1935. Uncertain economic conditions during the Great Depression and hurricane damage caused the railroad, which had become the Overseas Railway, to cease operations and the right-of-way was sold to the State of Florida for modification as a highway. During its period of operation, the popular railroad route operated trains between Miami and Key West three times a week. From Key West,

steamships made direct connections with Havana and elsewhere in Cuba. Many engineering structures associated with the railroad still stand and are now part of the Overseas Highway route through the Florida Keys. The development of the Florida East Coast Railroad to Miami and beyond did much to encourage commercial and resort development of southeast Florida. The railroad provided easy and relatively inexpensive access to Florida's southeast coast—the region's mild winters attracted increasing numbers of visitors and new residents settled in the area.

Following the end of World War I, the advent of the automobile and the construction of roads, such as the Dixie Highway from northern Michigan to Miami in 1925, contributed to the enhanced mobility of many Americans. By the late 1920s, southeastern Florida had become increasingly accessible.

Also during the 1920s, southeastern Florida became the focal point of considerable land speculation and extensive development schemes. In Miami, land promotions quickly transformed the small coastal town into a popular tourist destination. Completion of a bridge connecting Miami to a barrier reef and subsequent development of the reef through dredging resulted in development of the Miami Beach resort. By 1919, Miami Beach lots were selling quickly, and the value of beach property escalated quickly. Effects of this land promotion were also felt in the keys, where development continued throughout the 1930s despite deteriorating economic conditions, hurricanes, and unreliable transportation.

As the popularity of the Miami area grew, developers used the same dredging schemes that had created Miami Beach to build artificial islands and expand Boca Chita, Adams, and Elliott Keys in Biscayne Bay. Flagler, who had opened a resort on Soldier Key, was the first of these promoters. Later, prominent developers included Carl G. Fisher, founder of the Prest-O-Lite Company and the Indianapolis Speedway. In 1916, Fisher and two partners built a vacation lodge known as Cocolobo Cay Club along Caesar's Creek on Adams Key. Resort developments were established on other keys as well. On Elliott Key, Dr. John C. Gifford subdivided and sold 20-acre lots on which buyers built weekend residences and private fishing camps.

Development of Boca Chita Key during the 1930s by Mark C. Honeywell followed previous development work on the island by Carl Fisher, F. A. Seiberling, and Milton W. Harrison. Honeywell purchased Boca Chita Key from Harrison in 1937 and built a vacation retreat on the island. After their purchase of Boca Chita, the Honeywells retained earlier improvements built by Harrison, including a two-story frame house, and began building additional structures on the north end of the key. Constructed with Miami oolitic limestone between 1937 and 1940, the new structures included an ornamental lighthouse, chapel, picnic pavilion, and barn or garage. The Honeywells used the complex as a rural retreat and often entertained on the island. Mrs. Honeywell (Olive Lutz Honeywell) died in 1939, and Mark Honeywell sold Boca Chita to Florence Emerman six years later (Cullison and Leynes 1997).

The Great Depression, World War II, and Beyond. Following the severe hurricane season of 1926, the Florida economy slumped dramatically because much of the area's transportation was destroyed and land prices dropped. The state's economy continued to decline throughout the Great Depression. Public works programs initiated by President Franklin D. Roosevelt's administration, including the Public Works Administration and the Civilian Conservation Corp (CCC), were much in evidence in Florida during the 1930s. A major Works Progress Administration (WPA) project in the Florida Keys was initiated for reconstruction of the Overseas Highway, and a CCC camp was established north of the current park boundary at Matheson Hammock (Gannon 1996; Tebeau 1971).

Throughout the Great Depression, however, Miami and the keys remained resort areas for America's wealthy. In 1935, for instance, an estimated 600 millionaires spent the winter at Miami Beach.

With the coming of World War II, the nation's workforce was reemployed in support of the war effort. Because of its mild climate, Florida emerged as a key training center for both the U.S. Army Air Corps and the U.S. Navy. Highway and airport construction accelerated, and by war's end, Florida had a restored transportation network. One of the most significant demographic trends in Florida during the post-war era has been steady population growth as a result of extensive migration to the state from within the United States as well as countries throughout the Western Hemisphere, notably Cuba and Haiti. Florida is currently the fourth-most populous state in the nation.

During the post–World War II years, development of the Biscayne Keys revived with plans to connect the Upper Keys with the mainland. Proposals to accomplish this connection included construction of causeways over Biscayne Bay from Key Largo to the south and over the shoals of the Safety Valve on the north. A causeway to the keys did not materialize, and Dade County officials advised landowners that they would have to build the route themselves if they wanted to connect the Florida Keys to the mainland. In support of this project, resort-minded property owners on the keys incorporated, and the city of Islandia was established as a municipality in December 1960.

Developer's plans to build a causeway met organized opposition from conservationists promoting ecological protection for the Upper Keys. Controversy over divergent futures for the Biscayne Keys escalated during the early 1960s with residents of Islandia City advocating development of a road connection to the mainland and conservationists advocating environmental protection for the islands. In 1967, Islandia City bulldozer operators constructed a 120-foot-wide strip across the center of Elliott Key, subsequently known as the "Spite Highway," to advance and publicize the city's hopes for connecting the keys to the mainland. Despite the efforts of Islandia's citizens, however, momentum for establishment of a national park increased, and public hearings in the area resulted in calls for a national monument in the Upper Keys. Congress approved establishment of Biscayne National Monument with passage of Public Law 90-606 in 1968. The national monument was expanded in 1974 by the acquisition of Gold Key and Swan Key under the provisions of Public Law 93-477. In 1980, Public Law 96-287 expanded the northern boundaries of the national monument and redesignated the monument a national park.

ARCHEOLOGICAL RESOURCES

Settlement patterns on the Biscayne Keys reflect the strong influence of the maritime environment. Inhabitants of the keys of all time periods have depended primarily on the water for transportation and subsistence, and the waters and lands of Biscayne National Park are littered with physical remains that document human interaction with the marine and terrestrial environment of Florida's southeast coast. Evidence of this human interaction with the environment portrays a larger picture than its local context because the park is at the edge of the Gulf Stream and is part of the international maritime heritage of the Caribbean (NPS 1999, 2011).

Prehistoric Archeological Resources

Archeological resources in Biscayne National Park document more than 2,000 years of history and there is great potential for identifying submerged prehistoric cultural sites that relate to some 10,000 years of human settlement. Prehistoric archeological resources in the park richly portray the interaction with and human adaptation to the terrestrial and marine environment of Florida's southeastern coast (Lanzendorf 2001; NPS 1999, 2011).

The isolation of the northernmost Florida Keys in the area of Biscayne National Park has protected archeological sites from most recent development and has sheltered cultural resources that may hold the record of prehistoric human settlement patterns in South Florida. Preliminary and limited archeological surveys in the park were conducted beginning in the 1970s and continuing into the 21st century .These surveys examined both terrestrial areas of the keys as well as known submerged sites. In 1973, the Department of Anthropology, Florida Atlantic University, surveyed the coastlines of Elliott and Sands Keys and documented prehistoric sites Their survey did not include the interior of the islands and as such they found only relatively small sites that had been heavily impacted by shoreline erosion.

Significant and intact archeological sites have since been discovered within the interiors of Sands and Totten Keys. During the 1980s, the NPS Southeast Archeological Center (SEAC) staff examined a terrestrial site on Totten Key, and a Dade County archeologist conducted an archeological survey on Sands Key in 1990 (Carr and Beriault 2009). The results of these projects and subsequent investigations at the Sands Key and Totten Key sites have determined that they are rich in both prehistoric and early historic information and are eligible for listing in the National Register of Historic Places, potentially as a prehistoric district. Both sites contain archeological features that are unique and no longer represented anywhere else in the continental United States. Given the level of development in Miami-Dade and Monroe Counties, their current state of preservation and protection grants them substantial significance in the local culture history (Lawson 2009).

All of the known prehistoric archeological sites in Biscayne National Park are associated with the Glades culture sequence. In the park, Glades sites tend to be along the eastern shorelines of the keys or near inshore freshwater sources. Sites in the park are predominantly associated with the Glades IIa and Glades IIIa periods, distinguished by incised loops or arches, some grooved vessel lips, and the appearance of parallel incised lines on their ceramics. Because of wave-generated erosion, only two of the 10 prehistoric sites identified in the 1973 archeological survey could be positively classified into distinct Glades periods.

Prehistoric archeological sites in the park are found on Soldier, Sands, Elliott, Adams, and Totten Keys. Many other sites are suspected to be present, but much of the park, particularly Old Rhodes Key and the other southern islands, have yet to be systematically surveyed. The Cutler Fossil site (10,000 BP), immediately adjacent to the park on the mainland, strengthens the possibility that the lands and waters in the park may contain earlier sites than currently recorded.

Historic Archeological Resources

Following the last Glades period and during the historic period beginning in 1513, references in historic documents are made to the Tequesta culture group inhabiting the east coast of southern Florida and living on or using the resources of the Florida Keys. Several well-preserved Tequesta sites are in the park, and several site types are found in the keys. Additional Tequesta sites are undoubtedly present in submerged locations.

Lending credence to the argument for the potential presence of undiscovered Tequesta sites in the park is the Miami Circle site, on a 2.2-acre parcel on Brickell Point adjacent to the Brickell Avenue Financial District in downtown Miami. Discovered during archeological salvage excavations in 1998, the site is on the south bank of the mouth of the Miami River where it meets Biscayne Bay (4 miles north of Biscayne National Park). This archeological feature is 38 feet in diameter and consists of about 20 irregular basins and several hundred smaller postholes arranged in a nearly perfect circle that is recognizable when seen from above (Wheeler 2000; Wheeler and Mattick 2001).

Public outcry over the impending destruction of the Miami Circle and planned development of the property led to additional research at the site, which documented that the bedrock limestone formation had cut holes on about 70% of the property and intact accretionary midden deposits on at least 35% of the property. Miami Circle is the only known site of this type in Florida, and artifacts found at the site indicate that American Indians may have occupied it for about 2,000 years (Wheeler 2000; Wheeler and Mattick 2001). A cooperative effort among the State of Florida, Miami-Dade County, and many other public and private organizations and individuals led to the state's acquisition of the Brickell Point site and Miami Circle feature in 1999. The National Park Service conducted a study to determine the national significance, suitability, and feasibility of including the Miami Circle site in the national park system. The study found the site to be both suitable and feasible. The Miami Circle was designated a national historic landmark in 2009 and since 2011 has been managed by HistoryMiami (formerly the Historical Museum of Southern Florida) as the Miami Circle Park.

Since European contact with the North American continent, the Florida Keys have been a meeting point for maritime trade routes from Europe and the northeast American continent to the Caribbean, South America, and Mexico. The combination of geography and geological resources found in the park, including the Florida Reef, the Gulf Stream, and shallow waters, have often caused ships to wreck. The array of goods, ship parts, equipment, wreckage, and other artifacts left in the archeological record of the park indicates the sheer volume of the shipping trade that continues to pass through these waters. The historic maritime archeological record can reveal clues about ship construction, ship building techniques, economics, human behavior, and the history of international relations. Other maritime casualty events may be represented by jettisoned material such as ballast, cannon, and cargo (indicating sites of a stranding or grounding).

Ship repair, discard areas such as anchorages, remains of piers and other structures along the shore and fishing areas along the shoreline and in open water may also leave evidence in the historic archeological record. Shipwreck sites and other material remains of maritime casualties are now preserved as submerged archeological sites in the park, and some are listed in the National Register of Historic Places.

In 1975, a limited magnetometer search of known submerged resources was conducted by the NPS Southeast Archeological Center. The survey confirmed the location of several known submerged archeological sites. In 1980, SEAC staff and members of the NPS Submerged Cultural Resources Unit (now known as the Submerged Resources Center) conducted a magnetometer reconnaissance of 1 square mile of Legare Anchorage, locating the site of the shipwreck HMS *Fowey*. Additional testing and evaluation of the *Fowey* site was performed by SEAC staff in 1983 and again by Submerged Resources Center staff at various times in the 1990s. SEAC staff later conducted a submerged archeological inventory, including magnetometer survey and site assessment of 4,000 acres that confirmed 21 previously known sites and 14 new sites. A primary objective of this SEAC survey was to collect data in support of the nomination of the Offshore Reefs Archeological District to the National Register of Historic Places (Beditz 1980).

During three consecutive field seasons beginning in 1993, damage assessment of submerged cultural resources caused by Hurricane Andrew resulted in remote sensing of 46 square miles (about 29,500 acres) or 16% of the park by the Submerged Cultural Resources unit. During the late 1990s, information obtained via remote sensing was used to guide the park staff's archeological reconnaissance efforts in conducting dives at the sites of about 100 magnetic anomalies. These efforts culminated in an archeological survey of about 6,000 acres or 3% of the park.

Currently, there are more than 70 known submerged sites in the park, more than half of which are shipwrecks. The park's cultural resources program continues to work toward documenting each of these individual sites using NPS staff, volunteers, and outside researchers. Many of the most significant sites, including the HMS *Fowey*, the *Nuestra Senora de Populo*, the English China Wreck, the Outline Wreck, the Keel Showing Wreck, the Soldier Key Wreck , Captain Ed's Wreck, and each of the six Maritime Heritage Trail sites, have been at least preliminarily studied and documented. A near future goal for the program is the development of an archeological overview and assessment that will gather dispersed research on all of the park's archeological sites and present it in a single document. Concurrent with site documentation, a site-monitoring program was initiated to track the effects of storms and other natural processes, as well as human-caused effects (particularly looting) on submerged sites. Monitoring submerged sites indicates that the condition of many of the park's underwater archeological sites is unstable. The number, extent, and rate of deterioration from erosion of submerged archeological sites in the park remains unknown.

The monitoring program has been particularly active at the site of the HMS *Fowey*, a British warship that sank in a storm on the Florida Reef in 1748. After Hurricane Andrew in 1992, Biscayne National Park initiated the HMS *Fowey* project, an interdisciplinary project designed to stabilize and preserve the wreck. An objective of the project was to determine the feasibility of stabilizing the *Fowey* and establishing a long-term monitoring program. The wreck is on the seaward edge of the natural distribution of seagrass. There is no protective reef barrier, and the site is subject to wave action that continues to expose the wreck's structure and disperse its associated artifacts. The project included site mapping, evaluation, and remote sensing for further documentation and continued monitoring. Since that time, additional remote sensing has been completed as well as three-dimensional mapping (Skowronek and Fischer 2009). Stabilization plans did not materialize for the shipwreck until after Tropical Storm Sandy (2012) caused new damage to the wreck site. Congressional hurricane recovery funds were used in 2013 and 2014 to conduct additional archeological research followed by implementation of a sandbag stabilization plan, which covered the site with several feet of encapsulated sediment in hopes of arresting further erosion.

The HMS *Fowey* site is just one of many sites making up the Offshore Reefs Archeological District, which was listed in the National Register of Historic Places in 1984. The district's contributing resources include artifacts and remnants of more than 40 shipwrecks in various states of preservation embedded in and scattered across the Florida reef (Beditz 1980).

Climate change may impact archeological sites in Biscayne National Park if more erosion occurs because of increased storm frequency and intensity of sea level rise. As archeological and historic resources become submerged or compromised because of climate change, they become unavailable for archeological research and visitor enjoyment. Prehistoric sites on the islands are especially vulnerable because of the potential for inundation and increased shoreline erosion. Furthermore, rising sea levels could cover or destroy archeological sites yet to be identified on much of the unsurveyed lands in the park. The park's cultural resource program is currently working toward the complete survey of the park's terrestrial holdings and a full evaluation of the contents and significance of the known terrestrial sites. Historic shipwrecks and other maritime sites may also be compromised if amplified wave action occurs because of increased storm activity associated with global climate change. If the ongoing monitoring program determines that loss of any of these sites is inevitable, then steps will be taken to mitigate loss through archeological data recovery.

CULTURAL LANDSCAPES

Biscayne National Park's "Historic Resource Study" (1998) evaluated the park's cultural resources within five historic contexts—aboriginal populations and European American exploration (1513–1859); the wrecking industry (1513–1921); American settlement on the keys (1822–65); agriculture on the keys (1860–1926); and recreational development of Miami and Biscayne Bay (1896–1945). Since 1998, a single cultural landscape, the Honeywell Complex on Boca Chita Key, has been documented and a historic structure report and cultural landscape inventory completed for it in 2010. There remains potential for the identification of other cultural landscapes that reflect any of the park's five historic contexts.

A draft cultural landscape inventory (Level 0) was completed for the park in 1997. This initial inventory was limited to a review of existing park cultural resource and planning documents. The inventory suggested that the entire park could be considered one cultural landscape that reflected changes over time and determined that the marine environment was the unifying element common to all historic themes at the park.

Human occupation and settlement patterns in the Biscayne Bay region and on the keys were and continue to be greatly influenced by the water, and all occupation periods on the islands contribute to the bay's maritime history. Shell middens and concentrations of wrecked ships document aboriginal use of the area as well as European American exploration and exploitation. Shipwrecks and debris illustrate the tradition of marine salvage and the wrecking industry that thrived on the keys for nearly 400 years. Remnant landscape alterations for crop production and structures for human habitation and recreation endure on the keys as a testament to American settlement of the area, attempts at agriculture, and development of the keys as a scenic setting in which to recreate.

Evaluation of the park's cultural landscapes in the context of its larger regional cultural environment may be a valid approach because the park is physically, culturally, and environmentally associated with the Caribbean. The initial inventory also identified potential areas in the park that exhibit vestiges of human manipulation and adaptation of the landscape and thus require further documentation and evaluation as cultural landscapes.

Currently, the only documented cultural landscape in Biscayne National Park is the Boca Chita Key Historic District, an 11-acre site on the northern perimeter of Boca Chita Key. Its location and complex of historic structures in the Boca Chita Key Historic District is a unique example of recreational resort development that took place in the region during the 1920s and 30s, primarily by northern industrialists. The specific period of significance for the landscape is from 1937 to 1945, when Boca Chita Key was developed and actively used as a resort island by its owner at the time, Mark Honeywell, and other wealthy families that were active in the Miami social scene. The main historic structures in the district feature Miami oolitic limestone, are associated with the firm of prominent Miami architect August Geiger, and have maintained their integrity. All of the historic structures were constructed during the Honeywell era. Until 1992, there were several frame structures and historic vegetation that also dated to the Honeywell period, but Hurricane Andrew destroyed these features. Nevertheless, the setting and spatial character remain largely unchanged. Vegetation planted since Hurricane Andrew has helped to recreate the general landscape character that existed during the period of significance, primarily lawn and palm trees with views of the ocean, Biscayne Bay, and the island's historic lighthouse. Ownership of Boca Chita Key changed hands several times until it was acquired by the National Park Service in 1985. During this time it continued to serve primarily as a recreational site. The island is only accessible by boat and is still used for recreation, largely by weekend visitors from

the Miami area. A small harbor constructed before the period of significance allows overnight or short-term docking, and many visitors camp on the island.

Other keys in the park contain a combination of natural and cultural resources that might also be considered as cultural landscapes. Most notable among the homestead/ plantation remnants is the Sweeting Homestead (about 240 acres and listed in the National Register of Historic Places in 1997) near the northern edge of Elliott Key. Although most of the land was so rocky that it could be tilled only by hand with axes and hoes, the Sweetings cleared about 30 acres and planted bananas, pineapples, and tomatoes. During establishment of the farm, many large mangrove trees were cut, and the land was burned to create openings for pineapples and lime trees. The Sweetings farmed their Elliott Key homestead for some 24 years, during which they built six wood-frame houses, a school/church, a general store, a hurricane house, a chicken house, cabins for farmhands, packing houses, outhouses, and water cisterns (Niemiec and Mattick 1997; NPS 1997b).

The hurricane season of 1906 inundated Elliott Key, destroying the pineapple plants and rendering the soil infertile for future plantings. In 1975, Abner Sweeting sold the last parcel of the homestead to the U.S. government. Today, only rubble remains to mark the site of the Sweeting houses and buildings. The most intact remnants of the homestead are the cisterns and intentionally planted vegetation such as coconut trees, date palms, and seagrape trees (Niemiec and Mattick 1997; NPS 1997b).

An area encompassing portions of both Porgy and Totten Keys may also be considered a cultural landscape because of the built environment associated with the lives of Israel Lafayette Jones and his descendants who resided there from the late 19th century until well after the establishment of the national park. The Jones's story is a remarkable one of a black family that was able to obtain economic prosperity during the decades following the Civil War and throughout the years of racial segregation in the South. Following the Emancipation Proclamation, racial tensions arose throughout the country. Although many northern blacks experienced a circumscribed freedom, blacks still struggled with the fear of re-enslavement in southern states. In addition, further barriers were constructed for free blacks determined to build a new life. These included being denied the right to vote, being denied access to white business establishments and educational institutions, and being forbidden to hold religious services without the presence of a licensed white minister. Florida was no exception. Blacks who lived in what is now Miami-Dade County were largely runaway slaves and Bahamian blacks. Few possessed the means to establish a homestead and successful business. It is within this context that Israel Lafayette Jones traveled from North Carolina to Florida, developed agricultural and maritime skills, and successfully produced pineapples and limes on his own farm. Porgy Key was the site of both the family's home and agricultural enterprises. At Porgy Key, Israel Jones grew fruits and vegetables to support his family, as well as pineapples and key limes as a business. Jones's experience working on nearby islands, prior to the purchase of Porgy Key in 1897, provided him with practical knowledge of plants that would thrive in this hostile maritime environment. Totten Key was the site of agricultural production. Frank Budge owned a pineapple farm at Totten Key, which was managed by Israel Jones from the early 1890s until 1906 when a powerful hurricane slammed into the Florida Keys. An 8-foot surge of salt water swept over the island, leaving the soil unsuitable for growing pineapples. The deadly storm forced many pineapple farmers, including Frank Budge, to abandon their pineapple operations. As a result, Jones was able to purchase Totten Key from Budge in 1911 for $1 an acre. At Totten Key, Jones expanded his key lime production with the assistance of his sons. Cultural resources are found on both keys in hammock zones with overgrown mangrove vegetation surrounding these uplands in low marshy

areas. Hammocks were originally covered in overgrown vines and plants, not familiar to the mainland such as gumbo-limbo, palmetto and mahogany trees, and thorny vines. Settlers like Jones cleared the vegetation revealing a landscape of coral limestone. Burning was one technique used in clearing, and in addition to opening the landscape, also improved the fertility of the thin soil. Today, the extent of former farmland is distinguishable in the landscape with remnants of an aged key lime grove as well as new growth in volunteer saplings.

In addition to farming, Jones expanded his wealth through real estate and played an integral role in the development of the black community in the county. While the Jones family story is a significant example of the development of the black community in Miami-Dade County and of the county itself, it also provides a lens into the strategies undertaken by blacks and whites in Florida to negotiate a contentious time in U.S. history.

In addition to the remarkable story of Israel Jones himself, his sons, particularly Lancelot, were instrumental in bringing about the creation of Biscayne National Park. As the second-largest landowners in what was to become the park and the only permanent residents of the islands, the Jones family's preference toward the preservation and protection of the islands and water surrounding them provided needed support to the conservation movement in the 1960s that eventually halted development on the islands and led to the establishment of the park.

The Jones Family Historic District, composed of the sites on Porgy and Totten Keys, is listed in the National Register of Historic Places under criteria A and D because the district provides a unique example of exploration and settlement of the Florida Keys at the turn of the 20th century and because of its potential to enlighten the historic and archeological record concerning adaptive agricultural techniques in the Upper Florida Keys and Biscayne Bay. The two sites that comprise the district contain the potential for designation as a cultural landscape and include the ruins of Jones's homesite and farm on Porgy Key, a hand-dug canal in the shallow waters north of Totten Key, ruins (archeological vestiges of farming activities), and relict agricultural fields on Totten Key.

Biscayne National Park also contains the potential for establishment of a maritime cultural landscape inclusive of all the archeological and historic resources related to maritime activity in the park, whether they are on land or in the water. The maritime cultural landscape would encompass shipwrecks and submerged stranding sites, and could also include sites on the shore such as ruins of docks and wharves, Fowey Rocks Lighthouse, and other historic aids to navigation. Even the terrestrial domestic historic sites could be considered contributors to a maritime cultural landscape because of their inescapable dependence on the sea and, for the historic sites at least, their occupants' association with the tradition of marine salvage and the wrecking industry that thrived on the keys for nearly 400 years. The landscape would also include the natural geography of the park, i.e., the reef tract and shallow shoals whose placement adjacent to the heavily traveled Gulf Stream created the perfect storm for the loss of so many historic vessels.

Climate change may affect cultural landscapes and potential landscapes in the park, including Boca Chita Key Historic District, the Jones sites, the Sweeting Homestead, and any of the maritime sites. As identified as potential cultural landscapes, these areas represent connections between people and the land. Sea level rise, increased storm intensity or frequency, and increased air and water temperature may damage natural or cultural resources in these locations, compromising the cultural landscapes as a whole. The resilience of these landscapes may depend on their ability to withstand both gradual and extreme weather variations.

HISTORIC BUILDINGS AND STRUCTURES

List of Classified Structures

Biscayne National Park's "Historic Resource Study" generated a List of Classified Structures. This list, compiled in 1997, identified 11 historic structures, 10 of which are contributing resources in the Boca Chita Key Historic District. The district's 10 structures, which represent typical resort architecture for the Miami area in the 1930s, include a lighthouse, chapel, picnic pavilion, garage/barn, engine house and cistern, bridge, cannon, stone walls, canal, retaining walls, and concrete walkway. Since 1997, Fowey Rocks Lighthouse, the ruins of the Jones homesite and cistern, and a relic tractor and trailer at the Jones farm on Totten Key have been added to the park's List of Classified Structures, bringing the count to 14.

Boca Chita Key Historic District

Although Elliott Key is the largest of the islands in the park and was the center of agricultural activity on the Biscayne Keys during the late 19th and early 20th centuries, Boca Chita is the only key in the park containing substantial intact historic structures. The Boca Chita Key Historic District encompasses the northwest portion of the island and is bounded by Biscayne Bay on the west and Lewis Cut to the north (NPS 1997a).

The development of Boca Chita Key by Mark C. Honeywell in the late 1930s peaked near the end of the first wave of recreational and resort development in Miami and the Upper Keys during the first half of the 20th century. The growth and development of South Florida and the Miami area in the early 20th century was reflected in the Upper Keys primarily by resort development. As a wealthy group of industrialists found the subtropical climate and exotic nature of the keys a likely place to entertain themselves and their friends, they purchased the offshore keys and established vacation retreats. Thus, the Boca Chita structures represent typical resort development in Miami and South Florida during this period.

The earliest development on Boca Chita Key began in 1916 when Carl Fisher and F. A. Seiberling purchased the key. The first improvements were constructed by Seiberling and included a wooden bulkhead and several buildings for use by visitors. Seiberling also enlarged the key by adding fill material up to depths of 13 feet on top of the existing limestone, thus creating the present size of the key. Following the devastating hurricane season of 1926, Seiberling sold the key to Milton W. Harrison who replaced destroyed wooden bulkheads with steel, increased the depth and size of the boat basin, and built a two-story frame "cottage" with an upper veranda (which was destroyed by fire during the 1960s). In 1937, Harrison sold the key to Honeywell, and the Honeywell family transformed the relatively undeveloped key into a rural vacation retreat. During 1937–40, the Honeywells constructed a complex of nine buildings and manicured the landscape with ornamental plants to enhance their exclusive island vacation home.

Many of the structures on Boca Chita Key were designed by the August Geiger architectural firm in Miami and by Leon Angle Camp. The exterior surfaces of all of the structures were constructed of Miami limestone, a popular building material in South Florida during the early 20th century.

One of the most prominent features of the historic district is the 65-foot lighthouse north of the boat basin. The lighthouse was probably never intended to be used for navigation. Designed by Camp, the structure is a pared cylinder of concrete blocks clad in uncoursed limestone. Other buildings in the historic district have steeply pitched roofs and are rectangular in shape, Mediterranean in style, and of varying sizes. The picnic pavilion, across the boat basin from the lighthouse, is an open structure crowned by a classical cornice and frieze supporting the hipped

shingle roof. The two-story garage/barn, which is the largest structure in the complex, rests on a concrete slab foundation and features low chimneys at either end and four large door openings on the north façade.

The engine house has a front gable roof and an octagonal concrete cistern attached to the east wall. An arched concrete bridge crosses a narrow bulkheaded canal that is now dry after being blocked at the north end by a metal bulkhead in 1965. A cannon, which was fired to welcome guests, rests on a stone base near the bottom of the lighthouse. A limestone wall with seven gateways originally enclosed the primary structures in the complex, but only three gates are currently standing. Along the north shore of Boca Chita Key, the Honeywells constructed a limestone retaining wall that is deteriorating.

During the Honeywell period of ownership, Boca Chita Key was the scene of prestigious Miami society gatherings, including the annual charity party of the Miami Beach Committee of One Hundred. Honeywell lost interest in the Boca Chita property after the death of his wife and sold it to Florence Emerman in 1945 (Leynes and Cullison 1998; NPS 1997a).

Fowey Rocks Lighthouse

Fowey Rocks Lighthouse is a pile reef light built in 1878 to supersede the Key Biscayne Lighthouse at Cape Florida. Located east of Soldier Key, it is one of six built on the Florida Coral Reef between 1852 and 1880. Its lamp was first lit on June 15, 1878, and it still functions as an aid to navigation. Like the Eiffel Tower in Paris, cast-iron skeletal girders comprise its main octagonal construction. Known as the "Eye of Miami," the lighthouse was named for the nearby reef, Fowey Rocks, which itself was named for the 1748 shipwreck (HMS *Fowey*) that rests nearby.

The Fowey Rocks Lighthouse was designed and built by the United States Lighthouse Board (Department of the Treasury) and managed by the same agency until it was disestablished in favor of the United States Lighthouse Service (Department of Commerce) in 1910. The 110-foot-tall dark brown tower of the lighthouse has an attached residence and enclosed stair cylinder. During the mid-1930s, the light was changed from incandescent oil vapor to electric power from generators, and a radio beacon was installed. The Lighthouse Service maintained the light until 1939 when it merged with the U.S. Coast Guard (Armed Forces). The light was automated in 1972.

The history and architectural character of the lighthouse are an integral part of park history. The structure is listed in the National Register of Historic Places under criteria A and C because of its association with the history of 19th and 20th century shipping and transportation off the Florida coast and its iron architecture that is typical of pile reef lights along the Florida coast (NPS 1999; USCG 2010).

In 2012, the U.S. Coast Guard was prepared to excess the lighthouse under the authority of the National Historic Lighthouse Preservation Act of 2000 and make it available for auction or for transfer to a public or private entity prepared to preserve and interpret the lighthouse to the public. Because of the historic significance of the lighthouse and its location within the boundary of Biscayne National Park, the National Park Service chose to exercise its option under the National Historic Lighthouse Preservation Act and request direct transfer of the structure from the U.S. Coast Guard to the National Park Service. In 2012, the transfer was completed and the lighthouse became NPS property, although maintenance of the functioning aid to navigation remains the responsibility of the U.S. Coast Guard. The National Park Service intends to maintain the lighthouse in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties* and has initial plans in place to complete repairs that will stabilize the structure, protect it from further deterioration, and potentially provide visitor

access in the future. It is currently closed to visitation because of safety concerns.

Climate change may affect historic buildings and structures in various ways. Sea level rise may degrade foundational elements, while increased storm frequency and intensity may damage structures and materials. Additionally, rapid temperature changes or extreme weather may further weaken or cause deterioration of the original materials and structures such as Fowey Rocks Lighthouse and those on Boca Chita Key.

Some buildings and structures may eventually be compromised to the point where rehabilitation or restoration is not feasible, resulting in loss of these important cultural resources. As archeological and historic resources become submerged or compromised due to climate change, they may become less available for their archeological and historic value, research, and visitor enjoyment (Colette 2007).

Jones Family Historic District on Porgy and Totten Keys contains the archeological and structural ruins of the activities of Israel Lafayette Jones and his family. Jones made a home and farmstead on Porgy Key and eventually expanded a lucrative key lime production enterprise to Totten Key. Both sites are included in the National Register of Historic Places as an archeological and historic district. For the most part, the features that comprise the sites are in a ruinous state and are maintained as such by the park. But three of the individual site features are listed as historic structures on the park's List of Classified Structures. These include the concrete foundation remains of the Jones home on Porgy Key (built in 1912 by Israel and his brother Samuel Jones and destroyed by fire in 1982), the concrete ruins of the cistern at Porgy Key, and on Totten Key at the farm, an abandoned 1918 Model F Fordson tractor and trailer, purchased by Jones the first year a mass-produced tractor was available for sale in the U.S. market.

VISITOR EXPERIENCE

OVERVIEW

The park's proximity to the Miami-Dade County metropolitan area plays an important role in the type and level of visitation it receives. Approximately half a million people visit Biscayne National Park annually, primarily on the mainland. Many more visitors access the park via private or commercial boat from non-NPS marinas and are not recorded. Based on the "Biscayne National Park Visitor Study: Spring 2001" (NPS 2001b), about 75% of visitors were Florida residents. Data indicates that most of these Florida visitors live in the Miami-Dade County metropolitan area. The remaining 25% were a combination of visitors from other states (about 14%) and countries (11%).

The high percentage of visitation from the local area may indicate potential future use of the park. The U.S. Census Bureau projects a 53% increase in Florida population between 2010 and 2030.

Most local visitors have their own motorboat and access the park via nearby Miami-Dade County marinas, especially Homestead Bayfront Park, Black Point Park, and Matheson Hammock Park. The visitor surveys showed that most of these visitors had been to Biscayne before and usually visit the park at least twice a year. About 25% of visitors surveyed said they visit the park several times each year. Visitors usually come in small groups of two to four friends and/or family members and spend part or all of the day in the park. About 25% of the visitors may spend one or more nights camping on their boat or on one of the keys. A small percentage of visitors are long-distance boaters passing through the area. Many of the visitors who access the park by boat are unaware they are in a national park.

The main entrance to Biscayne National Park is at Convoy Point. Visitors who access the park by land use their own car or a rental vehicle. There currently is no public transportation to the park. The park is 35 miles south of Miami International Airport and 9 miles east of the nearest urban centers—the city of Homestead and Florida City. U.S. Highway 1 is the major north-south arterial that serves traffic coming south from Miami or north from the Florida Keys. On US-1 at Homestead, highway signs direct visitors east to Biscayne National Park via SW 328th Street, a recently widened four-lane road initially and narrowing to a rural two-lane road that passes by Homestead Miami Speedway and through extensive agricultural areas.

The park's main entrance road leads visitors directly to the parking area behind the Dante Fascell Visitor Center and park headquarters complex. This visitor center was completed in 1997. The visitor center is on the upper level of the complex and provides visitors views of the bay and Convoy Point. Inside the center, people can speak with park staff; obtain park information; purchase sales items through a concessioner; and experience a variety of interpretive exhibits, films, and programs.

The National Park Service is pursuing concession opportunities for visitors without a boat to access the islands for a fee. Other services could include a small retail store where visitors could buy sandwiches, soft drinks, practical/convenience vacation items, and souvenirs; the rental of paddlecraft; snorkeling and scuba diving equipment; snorkeling and scuba diving trips to the park's coral reefs and submerged cultural resources; boat tours to view the coral reefs without getting in the water; boat trips to park islands for guided tours and hikes; and a transport service to and from the mainland and Elliott or Boca Chita Keys for visitors who want to hike independently or camp. A small docking

area in front of the visitor center complex provides mooring for park patrol boats and concessioner boats and a few slips for public docking. Convoy Point has picnic tables and grills, a launching area for nonmotorized craft, a boardwalk, and shoreline fishing. However, no public powerboat launch is provided. Convenient access to boat launch facilities is found nearby at Homestead Bay Front Marina, South of Convoy Point.

VISITATION LEVELS

Severe damage to the park by Hurricane Andrew in 1992 significantly reduced park visitation from late 1992 through 1994. Since then, annual visitation levels have returned to a more normal pattern. In recent years, hurricanes have resulted in short-term closures (such as Hurricanes Ivan and Jeanne in 2004 and Wilma in 2005) and have periodically affected summer/fall visitation levels. In 2008, the region saw few bad storms, which may have led to the dramatic visitation increase from the 2007 number.

Park visitation varies by season, with about one-third of visitation in the summer (June, July, and August). There is also high visitation in October and around the Christmas and New Year's holidays.

TABLE 8. ANNUAL VISITATION 1998–2013

Annual Visitation		
Year	**Total Visits**	**% Change from Previous Year**
2013	486,848	-1.8%
2012	495,613	4.1%
2011	476,077	1.8%
2010	467,612	6.8%
2009	437,745	-36.2%
2008	686,062	32.6%
2007	517,442	-15.0%
2006	608,836	8.0%
2005	563,728	17.7%
2004	478,304	-2.4%
2003	490,031	-4.6%
2002	513,397	4.9%
2001	489,343	24.5%
2000	393,151	-11.2%
1999	442,585	9.8%
1998	403,239	2.8%

NOTE: This data has been compiled from the NPS Visitor Use Statistics Office information at https://irma.nps.gov/Stats/Reports/Park.

TABLE 9. MONTHLY VISITATION 2003–13

Monthly Visitation											
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Jan	31,919	46,072	36,890	41,208	44,672	23,086	34,397	17,535	26,961	29,877	33,790
Feb	36,473	25,368	29,993	34,520	34,284	38,107	24,041	18,381	29,136	28,749	29,960
Mar	44,155	35,138	35,935	39,131	45,363	41,725	24,164	29,620	40,109	46,277	38,524
Apr	42,650	40,813	49,550	50,254	45,652	49,551	33,513	46,593	48,625	44,910	40,016
May	53,018	50,978	50,283	50,464	40,736	55,351	55,053	60,484	57,222	53,922	54,354
Jun	30,740	61,395	61,005	65,065	52,932	48,754	53,902	61,808	46,740	49,160	55,272
Jul	60,014	68,247	87,592	83,212	62,126	75,299	60,824	59,771	71,509	65,594	48,572
Aug	56,524	43,648	45,859	47,226	52,222	45,413	46,295	54,211	48,281	46,782	61,031
Sep	33,197	17,178	26,186	34,903	41,955	31,468	18,937	32,666	31,260	38,956	42,389
Oct	56,771	40,851	75,962	97,418	31,017	113,151	35,030	43,032	28,514	32,782	36,185
Nov	21,475	24,255	26,160	31,227	32,998	96,736	26,938	23,102	21,045	28,447	22,189
Dec	23,095	24,361	38,313	34,208	33,485	67,421	24,651	20,409	26,675	30,157	24,566
TOTAL	**490,031**	**478,304**	**563,728**	**608,836**	**517,442**	**686,062**	**437,745**	**467,612**	**476,077**	**495,613**	**468,848**

NOTE: The official NPS statistics website lists two sets of data for annual/monthly visitation to Biscayne National Park. Current data may be found at https://irma.nps.gov/Stats/Reports/Park.

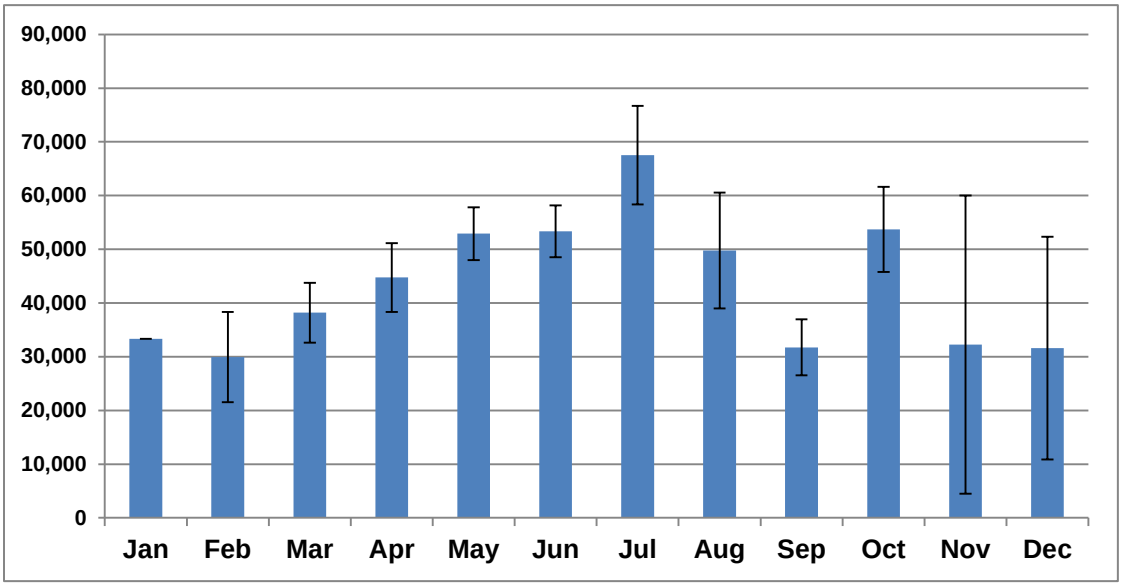


FIGURE 2. AVERAGE MONTHLY VISITATION 2003–13

In a visitor survey conducted in 2009, Senor (2010) found that most local visitors (61.7%) participated in land-based activities such as walking, picnicking, or fishing from shore. A minority (38.3%) engaged in water-based activities. Survey results indicate that the main motivations for visiting the park were based on its convenient location; a third of respondents cited such factors as free entrance and proximity to where they live. Other purposes local visitors use the park for include fishing, family time and bonding, picnicking, and general relaxing. A third of respondents mentioned the park as a place to snorkel but not dive (Senor 2010).

VISITOR INFORMATION, INTERPRETATION, AND EDUCATION

Visitors can obtain information about the park from a variety of sources such as the park website, travel guides, area visitor centers, marinas, dive shops, etc. Other sources include newspapers and magazines; marinas; tackle, bait, or dive shops; other websites; broadcast programs, visitor's bureau; Chamber of Commerce; and fishing guides.

Many park interpretive programs and classes are held at the visitor center and elsewhere in the park, exposing visitors to a variety of learning opportunities related to park resources, conservation, boating safety, and outdoor skills. To help increase children's awareness of the park, park interpreters go to the local schools and conduct special programs about the park and its natural and cultural resources.

Also, the park has offered an environmental education program to area students since 1976. The program has been held on Elliott Key since 1992 when Hurricane Andrew damaged facilities on Adams Key. The program is held from November through March and is a three-day, two-night field trip for 5th through 8th graders (and occasionally high school groups). The students camp on the island and study park habitats such as the mangrove shoreline, coastal transition forest, hardwood hammock, intertidal zone, and seagrass beds. Ranger-led activities may include shoreline "wet" walks, hammock explorations, night walks, and campfire programs. For indoor activities, the students use what was originally the Elliott Key visitor contact facility. It has been adapted for use by this program and for park operations offices. Approximately 200 to 250 students participate in the park's camping program each year.

In the 2009 survey, only half of respondents could correctly identify and explain the ecological importance of Biscayne's marine resources, although nearly all valued the natural resources and conditions highly. Thirty-five percent of respondents would state the importance of park resources but could not name any resources within the park or explain why they thought they were important. Also, 27% of respondents were observed littering, were surrounded by trash, or were disobeying regulations (i.e., fishing off a well-marked restricted area of the jetty) even while they were explaining how they viewed the natural resources to be important (Senor 2010).

RECREATIONAL ACTIVITIES

Visitors to the park participate in a wide range of recreational activities that are primarily oriented to the marine environment. Activities include powerboating, sailing, paddling, windsurfing, kiteboarding, fishing nature viewing, swimming, hiking, camping, interpretive programs, nature walks, picnicking, and stargazing. Many people scuba dive and snorkel to see coral, fish, and underwater artifacts. The use of personal watercraft (commonly referred to as jet skis, waverunners, seadoos, etc.) is banned in Biscayne National Park as well as most other national park system areas.

Based on the 2009 local visitor survey, the activity valued the most was wildlife viewing.

Local visitors also expressed high importance values for picnicking, fishing, and swimming (Senor 2010). Interestingly, motorboating ranked 8th out of the 10 activities listed by importance. Many visitors may participate in more than one of these activities.

South Biscayne Bay, with its many small islands and remote lagoon, is popular for nature viewing, photography, paddling, and experiencing solitude. The more open expanses typical of North Biscayne Bay are used primarily for powerboating, although sailing and nature viewing also occur there. The large shoal complex in the northeast corner of the bay known as the Safety Valve, is popular for fishing, powerboating, and sailing. The larger keys, such as Boca Chita, Elliott, and Adams, and their immediate waters, are very popular locations for nature viewing, hiking, camping (both boat and island), picnicking, photography, swimming, fishing, sailing, powerboating, and solitude. The north coral reef is a popular area for snorkeling, scuba diving, boat camping, powerboating, picnicking, swimming, fishing, and photography. The south coral reef is popular primarily as a destination for snorkeling, scuba diving, and fishing.

Opportunities on the Keys

At the north end of Boca Chita Key is the island's harbor, a historic ornamental lighthouse, a public campground with picnic tables and grills, a separate picnic pavilion, and a saltwater restroom. Overnight docking is permitted, and many people camp on their boats. Pets are not allowed on the island or on vessels attached to the island. There is no fresh water available. A 0.5-mile trail winds through the island. The lighthouse is open to visitors when park staff are available. Boca Chita Key also has several beaches—the most popular is the one that faces the old pilings on Ragged Key No. 5.

On the west side of Elliott Key, adjacent to its harbor, is the main visitor use area. This developed area includes a public campground with grills and picnic tables, drinking water, restrooms with cold showers, a ranger station/environmental education facility, and a buoyed-off swim area. Overnight docking is permitted, and many people camp on their boat. Pets are allowed on a leash. A mile-long hiking trail starts on the bay side of the island at the north end of the campground. The trail leads east across the island and then south, where it meets with a universally accessible boardwalk. This short, 1,200-foot boardwalk, which was reconstructed after Hurricane Wilma, features six wayside exhibits and leads to the group campsite and campfire circle. The widened hiking trail then continues west across the island to the harbor. Hurricane Irene destroyed the universally-accessible boardwalk that once connected this trail to the island's eastern shoreline in 1999. It has been rebuilt at least twice, most recently in 2009. Another approximately 6-mile trail runs nearly the length of the island. That trail is on the Spite Highway, a road that was started but never completed before establishment of the park.

Adams Key is a day use area only. There is a pavilion with picnic tables and barbecue grills nearby and a short hiking trail north of the open grass area. Bathrooms have saltwater toilets only. No fresh water is available, and overnight docking is not permitted.

Soldier Key, Arsenicker Key, West Arsenicker Key, and Sands Key are closed to the public to protect turtle and bird life. Ragged Key No. 1 is closed from May through mid-September to protect nesting birds.

Boating. The boating community can be divided into two major groups—powerboaters and sailors. They use different kinds of vessels and different portions of the park.

Most powerboat enthusiasts at Biscayne are local residents and come from a wide range of socioeconomic classes. Their boats usually range from 18 feet to 30 feet in length and

have relatively large, two-stroke, outboard motors. Powerboaters often simply cruise around inside and outside Biscayne Bay and take in the sights. Other times they have special fishing and scuba diving destinations. Sometimes boaters hike and/or explore the islands. Frequently, boaters visit favorite anchorages and coves such as the "sandbar" (Safety Valve) near Stiltsville Key, Sands Cut, and Adams Key. At the Safety Valve and Sands Cut, boaters often raft up, sit in lawn chairs in the shallow water, play music, wade around, and socialize. In recent years at Sands Cut, there has been a tremendous increase in visitation and crowding-related incidents such as public intoxication, fights, and drug use. On busy weekends, as many as 200 to 500 boats and thousands of people have been observed there. The sheer number of individuals and boats at the "sandbar" make it extremely difficult to patrol and manage for visitor safety and resource protection.

Boat registration data for the tri-county area of Miami-Dade, Monroe, and Broward Counties (figure 3) shows a consistent upward trend in the number of registered recreational class 1 and 2 boats (16-foot to 40-foot boats) in the past 10 years. Given the continuing trend in population growth in this region, boat ownership is anticipated to continue to grow. Figure 3 from the research report "An Aerial Survey Method for Estimation of Boater Use in Biscayne National Park During 2003–2004" (Ault et al. 2008) shows additional data of recreational boat registrations in the region.

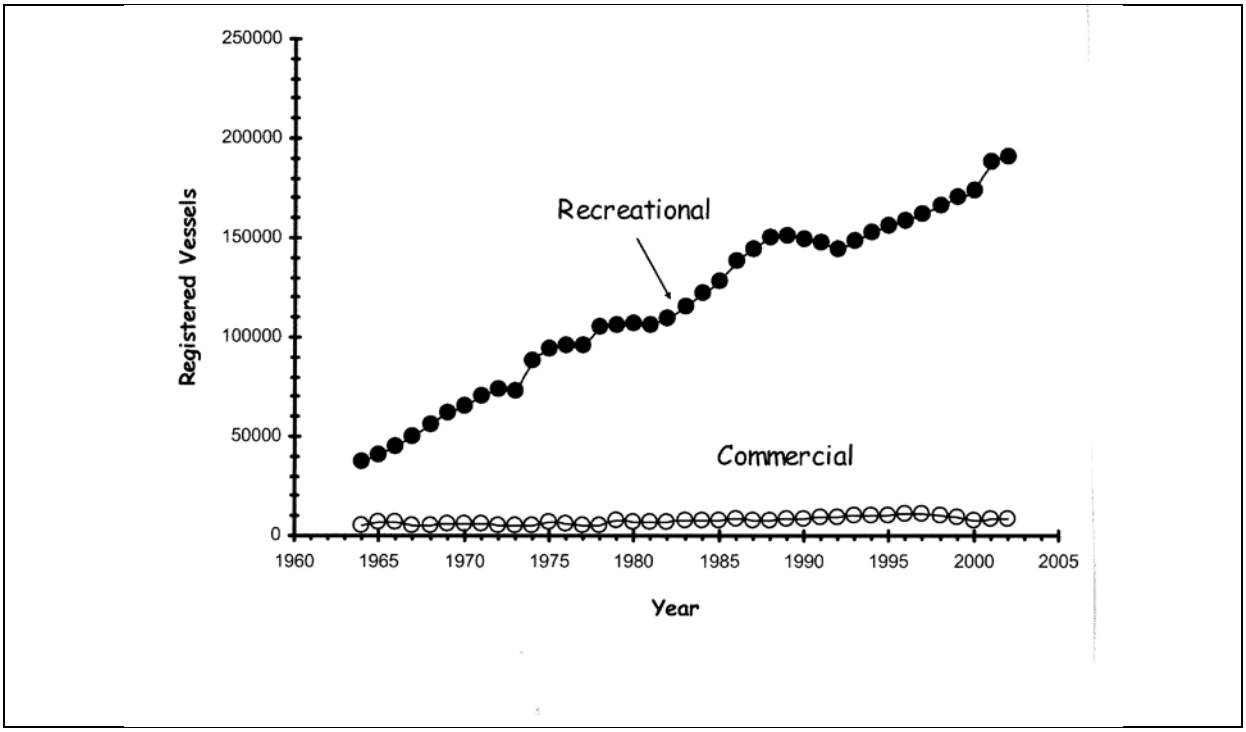


FIGURE 3. THE NUMBER OF RECREATIONAL AND COMMERCIAL REGISTERED VESSELS IN SOUTH FLORIDA FROM 1964–2002

(5 Counties: Broward, Collier, Miami-Dade, Monroe, Palm Beach)
NOTE: Taken from "An Aerial Survey Method for Estimation of Boater Use in Biscayne National Park during 2003–2004." (Ault et al. 2008 figure 2, page 3)

Powerboaters often run aground on various shoals in the park, including Biscayne Channel, the West, Middle, and East Featherbed Banks, and Cutter Bank. Boaters also run aground on shallow coral reefs. Considerable damage to seagrass meadows and reefs occur when they attempt to power out. Stranded boaters often call a tow boat operator for assistance, who then contacts the park, and together the park staff and tow operator decide on the best approach to remove the boat with minimal damage to the resource. Frequently, the park charges the responsible party for the damages and cost to rehabilitate the damaged site. Commercial boats and ships have also run aground in the park. A 1996 reef grounding of the *Igloo Moon* resulted in the courts awarding the park $1 million in damages to cover the costs of assessing, monitoring, and restoring reef damage.

For visitors who do not have their own powerboat, the park's future concessioner offers boating opportunities. At Convoy Point, visitors can rent a paddlecraft, take a glass-bottom boat tour, or sign up for a snorkeling or scuba diving trip. The concessioner could also offer transportation to the Keys and regularly scheduled guided trips.

Biscayne also offers sailing opportunities. Sailboats range from small dinghies to craft more than 50 feet long. Most sailing in the park is day sailing, even though many of the boats are designed for overnight use. Sailors who were interviewed said they frequently sail in the park and through to offshore waters, but do not use park facilities very often.

They mentioned that Biscayne is a good place to sail because of the warm air and water, good wind, and beautiful scenery

The Columbus Day Regatta, initiated in 1954, may be Florida's oldest sailing race and features numerous classes and trophies. Until recently, this event was held in park waters; now it is held just outside the park boundary. It is not a heavily sponsored event and is geared toward families and casual sailors. This event has become unintentionally associated with a large, raucous, boat party that occurs in the park boundary at the same time. This "party" has overshadowed the regatta and caused law enforcement and public health and safety concerns for the park. The following photo (figure 4) from the research report "An Aerial Survey Method for Estimation of Boater Use in Biscayne National Park During 2003–04" (Ault et al. 2008) depicts powerboats at the Columbus Day Regatta.

There are other, smaller groups of nonmotorized boaters in the park. These are mostly recreational paddlers who seek more secluded or shallow, protected waters away from powerboats, such as along the mangrove shoreline and the south bay in and around Jones Lagoon.

Based on surveys and associated boat trailer counts conducted by park staff and others, it was found that small powerboats less than 30 feet in length account for most (50%–80 %) of the vessels in park waters regardless of the day of week or season. Surveyed boats fell primarily into three categories—cruising, anchored, and fishing. Persons on anchored vessels generally engage in picnicking, sunbathing, swimming, and the like. Notable concentrations of these vessels are observed near Elliott Key and at Sands Cut on most weekends and holidays during spring, summer, and fall.

Those vessels engaged in fishing were most prevalent during the week (30%–45%) from spring through fall. Scuba diving and snorkeling activities are highest in the summer.

FIGURE 4. AERIAL PHOTOS OF COLUMBUS DAY REGATTA WEEKEND

The primary purpose of the aerial and boat trailer survey was to check and adjust the formula the park uses to estimate boating use in the park. The research revealed that for every season there is a very reliable linear relationship between the number of boat trailers at the nearby marinas and the number of boats in the park; however, the survey also revealed that during special high-use events like the Columbus Day Weekend event or the Florida Sport Lobster Season opening event, this linear relationship is not valid. For these special occasions researchers recommend that boat estimates be taken directly from aerial surveys. The 2004 aerial survey contains data on the composition and spatial distribution of the park visitor fleet that will assist the park in future studies to evaluate the biological and socioeconomic aspects of visitor use. Figure 5 from the research report "An Aerial Survey Method for Estimation of Boater Use in Biscayne National Park During 2003–2004" shows the relative frequency of vessel use categories.

Snorkeling and Scuba Diving. Snorkeling and scuba diving are popular activities in the park, particularly from December through August, with June and July being the most popular times because of warmer water and underwater clarity. Most scuba divers are South Florida residents. Divers may access the park using a commercial operator or their own vessels. Most scuba diving groups come as part of dive club activities or dive-shop-sponsored trips.

Snorkeling is a popular activity. Snorkelers tend to go to shallow dive spots like One-Mile Reef, One-Half-Mile Reef, and Marker 3. During bad weather, snorkelers and scuba divers alike will move into the protection of the bay. A number of recreational boaters may go snorkeling as an adjunct to other activities, such as picnicking or socializing.

Maritime Heritage Trail. Biscayne National Park's Maritime Heritage Trail provides opportunities for exploring the remains of some of the park's many shipwrecks. Six wrecks, spanning nearly a century and a wide variety of sizes and vessel types, have been prepared for public viewing. The six sites include *Arratoon Apcar* (sank 1878), *Erl King* (sank 1891), *Alicia* (sank 1905), *Lugano* (sank 1913), *Mandalay* (sank 1966), and a 19th century wooden sailing vessel. These preparations include mapping, installation of mooring buoys, and the production of waterproof site cards for each of the wrecks.

Access to the wrecks is by boat only, and all but the *Mandalay* are best suited to scuba divers. The *Mandalay* offers an unparalleled opportunity for snorkelers to experience a wreck. Information regarding the wrecks may be found on the park website.

CLIMATE CHANGE

The impacts of climate change on visitor experience may range from altered timing of visitation to restrictions on public access. Longer, hotter summers may shift visitation to the spring and fall seasons, and visitation may decline during the hottest summer months or during months with increased storms. Visitor facilities may need to be upgraded or moved to withstand severe weather and floods. Energy expenditure for temperature control for buildings may increase in the summer and decline in the winter. Pollen-based allergies and outbreaks of mosquito-borne diseases may also increase. Visitation for wildlife viewing and fishing may change if new species from the south shift northward into the park or if extant species move northward or have dramatic declines in population, as might occur with the manatee. Sea level rise and erosion, or the need to protect certain areas, may alter visitor access to certain parts of the park.

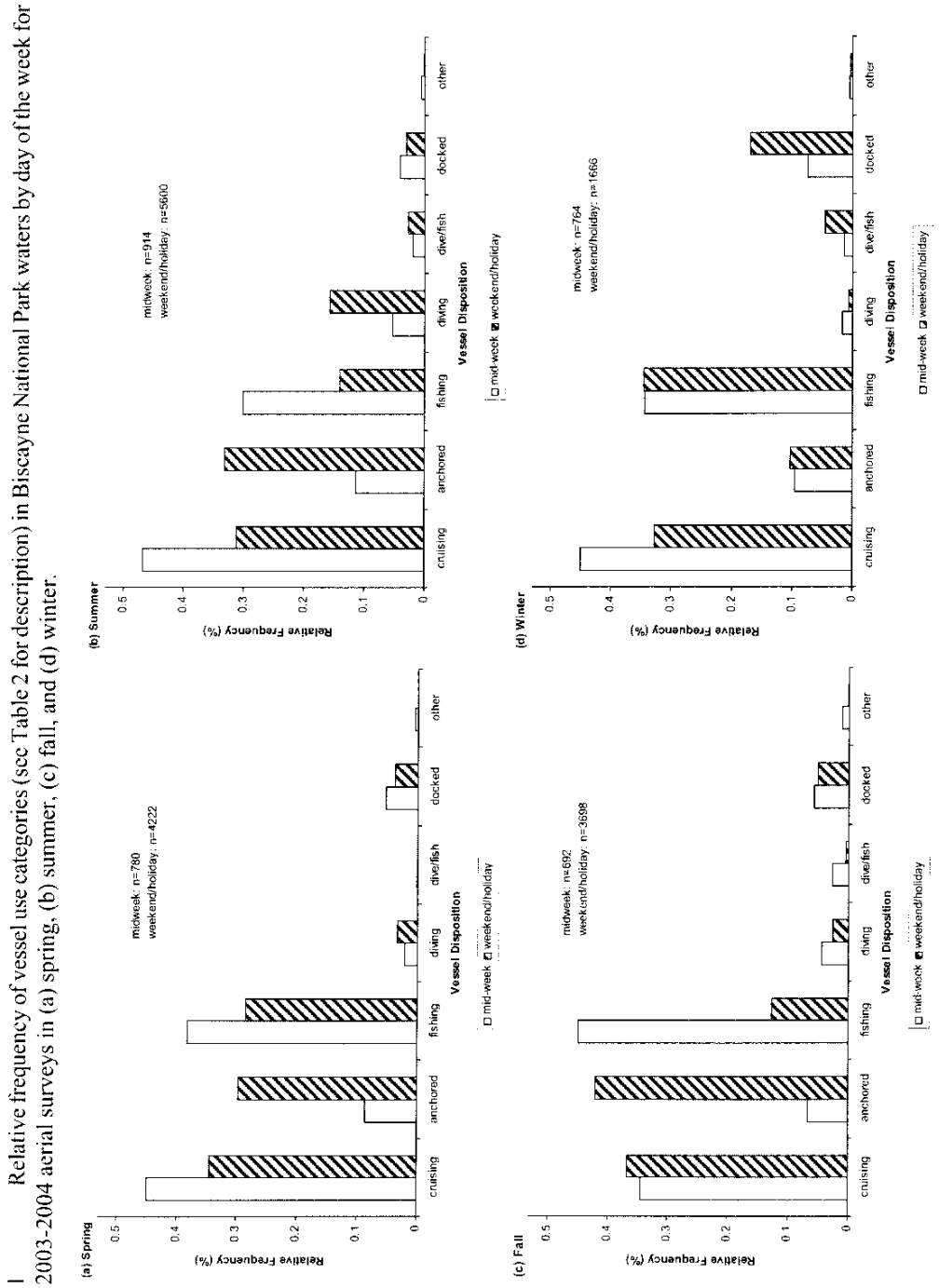


FIGURE 5. RELATIVE FREQUENCY OF VESSEL USE CATEGORIES

NOTE: Taken from "An Aerial Survey Method for Estimation of Boater Use in Biscayne National Park during 2003–2004." (Ault et al. 2008 figure 5, page 13)

Recreational Fishing. Recreational fishing is among the most popular activities at the park. A Florida recreational saltwater fishing license is required. Most recreational fishermen are anglers, although about 20% engage in spearfishing. The popularity of spearfishing has increased substantially from the 8% documented in 1997.

Known locally as the bonefish fishery, it is one of the most popular types. Bonefish are found in shallow water areas in the bay and are highly prized for their size (other shallow water fish are also targeted). Some anglers hire local bonefish guides for half- or full-day trips. The more popular areas are the flats on the east or west sides of the bay, and the east side of Elliott Key. Small boats with outboard motors are used. Once on the fishing grounds, the motor is turned off and the boat is moved by a push pole.

Although fishing occurs everywhere in the marine areas of the park, some fishers report their favorite areas are the northeastern corner and the southern portion. The common catch includes snappers, grunts, and spiny lobster. Up to several dozen offshore fishing boats operate in the park. These are larger (30 to 50 feet), diesel-powered boats that may consume 100 to 150 gallons of diesel fuel per day. Many offshore boats only pass through the park or stop to get bait. These boats may travel up to 25 miles offshore.

Shipping and Other Through Transit. The park is used by many people who transit through on the way to other destinations. The Intracoastal Waterway is a major north-south route used by the maritime industry, including tugs and barges destined for the Turkey Point Power Plant south of Convoy Point. Many boaters and fishermen go through the park to access more distant offshore locations.

VISITOR PERCEPTIONS

The National Park Service conducts periodic servicewide visitor surveys. The feedback visitors provide gives park managers a snapshot in time of how visitors perceived their park experience.

Using survey results from 2000 to 2010, 90% to 100% of the visitors surveyed were satisfied overall with the appropriate facilities, services, and recreational opportunities available at the park. Breaking these statistics down further, the surveys revealed that a high percentage of those who responded rated the following categories of visitor services provided as “good” to “very good”:

- 97% assistance from park staff
- 94% campground/picnic areas
- 72% commercial services
- 85% exhibits
- 91% learning about nature, history, and culture
- 90% outdoor recreation
- 95% park map/brochure
- 93% ranger programs
- 94% restrooms
- 98% visitor center
- 94% walkways, trails, roads

Visitors were asked some questions concerning fishing at Biscayne National Park, including the most important factors that result in a successful fishing experience. The most important factors were the size, number, and type of fish caught. Of slightly less importance were such factors as the number of legal-sized fish that can be taken home, boat ramp conditions, or the number of other anglers encountered.

Visitors were asked what they liked most about their visit and the park received more than 500 comments. The most frequently noted qualities were the park’s natural beauty (137 comments) and peacefulness (56 comments). Other qualities that received a dozen or more comments included clean facilities, the water, fishing, the visitor center, helpful staff, solitude, and weather.

NATIONAL PARK SERVICE OPERATIONS

ADMINISTRATION

Biscayne National Park is administered by a park superintendent and 56 staff who are headquartered in the park at Convoy Point, near Homestead, Florida. Park staff are responsible for managing 173,904 acres of land and water and more than 500,000 visitors annually with a budget of $4,310,500 (2010 figure).

Management of the park is organized into five divisions—administration, visitor protection, resource management, interpretation, and maintenance. Forty-five full-time staff are allocated among these divisions. Park staff believe that the number of current employees would need to be increased by 25% to stay current with resource protection and facility maintenance and to make adequate contacts with visitors.

Personnel in each division are duty-stationed at Convoy Point; however, some maintenance, interpretation, and visitor protection staff travel from the mainland to the keys daily. Park employees regularly visit Elliott, Boca Chita, Sands, and Adams Keys. In addition, two employees live on Elliott Key and two employees live on Adams Key. The other keys in the park, as well as the coral reef platforms and bay shoals, are visited during routine patrols or as research and maintenance needs dictate.

The superintendent of Biscayne National Park is responsible for the overall management of the park, and the assistant superintendent functions as the chief of operations. An administrative staff of five has responsibility for payroll, budget, procurement, contracting, and human resources management.

Biscayne also operates a dive program. The program operates under the superintendent and currently consists of 23 divers that use the function as a tool for various park duties and operations. The team will likely increase in numbers under all alternatives.

Visitor and Resource Protection Division

Laws and regulations at Biscayne National Park are enforced under concurrent jurisdiction. This means that other agencies with law enforcement capability in the region are invited to assist park rangers in enforcing state and federal laws within the park. The park has a memorandum of understanding with the U.S. Coast Guard whereby the Coast Guard provides maintenance of navigational equipment and markers on the Intracoastal Waterway within the park.

The visitor and resource protection staff is responsible for resource protection, managing visitor safety and experience, boating safety, contacting visitors on vessels and on the keys, recreational and commercial fishery resource inspections, search and rescue activities, emergency medical services, fire protection, and managing campgrounds on Elliott and Boca Chita Keys. Visitor and resource protection staff duties include vessel and safety equipment upkeep and assistance to other law enforcement agencies. The visitor and resource protection staff is composed of eight commissioned law enforcement rangers.

Resource protection duties include responding to hazardous materials spills in the park. In the past, hazardous materials spills have released fuel oils into park waters. The visitor and resource protection staff participate in incident command system scenarios with other land and water management agencies in the region to plan for hazardous spills response. Additional training is needed for staff handling these materials.

With boating as the most prevalent visitor activity in the park, the primary focus of the law enforcement staff is resource protection and visitor safety on the water and on the keys. Because Miami-Dade County has the most registered vessels of any county in Florida, an important aspect of visitor and resource protection responsibilities are boating safety and fishery resource inspections. Weekends in the park are crowded, and special events can attract as many as 5,000 boats in Biscayne Bay. For example, Columbus Day Weekend attracts multitudes of vessels, many of which tie together in rafts of up to five boats. Another crowded time in the park occurs in July with the lobster mini-season.

Conducting patrols in the park is another duty that rangers perform. The park receives a variety of visitors, including commercial fishing boats. Rangers contact park users to inform them of park regulations and to check vessels for safety or resource violations such as illegal fishing or removal of resources. Radar is used primarily to ascertain vessel positions and track storms. Radar can help determine the position of boats in the park, but is not regularly used as a tool to pursue resource violations.

Patrol operations are directed toward specific areas and activities based on day of work, season, weather, and other factors, frequently focusing on specific resource problems such as recreational fishing, boat groundings, or traffic issues. Enforcement of prohibited activities is also a duty of patrol rangers. Sensitive areas are patrolled when other staff observes or receives notice of suspicious activities. Patrols are also conducted on Convoy Point for traffic, noise, and fishing violations. The lack of adequate staff becomes a safety issue when a ranger must patrol and board a vessel alone.

The park needs a reliable radio communications system for patrolling rangers, especially when they might be dealing with drug or smuggling operations or performing search and rescue operations. The park has converted to narrow-band radio frequency radios. Radio transmitters or repeaters are at Convoy Point and on Elliott and Adams Keys. In addition, the park uses a radio transmitter at Cape Florida (Key Biscayne). Law enforcement rangers use radio dispatch services provided by Everglades National Park.

Potential safety hazards in the park for employees and visitors include contacting and sustaining injuries from marine life such as coral and jelly fish, sunburn, falls off boats and from boat bridges onto boat decks, abrasions from fishing knives and fishhooks, and the potential for drowning.

Resource Management Division

The Resource Management Division conducts inventory, monitoring, restoration, and other investigative studies for managing the cultural resources of the park as well as the coral reef and the estuarine and terrestrial environments that comprise the complex natural ecosystem of the park. The division also has a damage assessment and recovery program (which includes restoration of damaged habitats). This division is charged with preserving and protecting an estuarine system adjacent to one of the northernmost extensions of pristine coral reefs in the United States. The permanent, full-time, resource management staff are routinely supplemented by temporary, term, and contracted employees, as well as interns and volunteers who assist with resource projects and program support. The division conducts research and studies internally through the efforts of staff biologists, ecologists, and archeologists and/or in conjunction with other cooperators.

The primary focus for the natural resources management program of Biscayne National Park concerns the areas of water quality and quantity, fishery resources and wildlife management, integrated pest management of plant and animal species, damage assessment and recovery associated with vessel groundings, inventory and monitoring

sensitive terrestrial and marine resources, and cultural resource management. Programs assessing the condition and status of corals, threatened and endangered species, and seagrass communities are used to compile baseline data and measure impacts on these resources, but many issues including the dynamics of the reef community and current hydrological influences on reef resources are not fully understood.

Responsibility for surveying and documenting cultural resources, including archeological sites, historic structures, ethnographic resources, and museum collections, is also the domain of the Resource Management Division. Cultural resources in Biscayne National Park document more than 2,000 years of history. These resources are rich with the physical remains that depict an international maritime history at the crossroads of exploration and world maritime trade since the arrival of the first Europeans at the beginning of the 16th century. The primary focus of the cultural resource management program is to minimize degradation to historic structures and archeological sites through field assessment, mapping and monitoring; identifying sites eligible for the National Register of Historic Places; and developing strategies for visitor use of historic sites that optimizes visitor experience while minimizing visitor-use impacts.

The Resource Management Division also coordinates park participation in the Comprehensive Everglades Restoration Plan. The division tracks projects, participates as members of an interagency steering committee, meets with Everglades National Park program coordinators, and represents Biscayne National Park's vested interests within the overall comprehensive plan. Resource management is responsible for managing the park's geospatial data and maintaining GIS cultural and ecological data, as well as a variety of base maps. The evolution of GIS software and associated digital data management is providing ever-increasing opportunities for research and environmental and cultural modeling.

The Resource Management Division also closely coordinates with the local NPS Inventory and Monitoring Network, the South Florida Caribbean Network, which provides inventory and monitoring on a variety of organisms in network parks.

Permits to conduct research in the park are reviewed and recommended for approval by the Resource Management Division to the superintendent. A number of ongoing research projects are designed to systematically explore and study the natural and cultural resources of the park.

Interpretation Division

Interpretation and educational outreach play an integral part in accomplishing the park mission of conserving resources, advocating stewardship, and enabling visitors to experience and appreciate tranquility, scenic vistas, compatible recreation, and the underwater environment. Ten permanent interpreters and typically two to four seasonal staff provide orientation and interpret the natural and cultural aspects of the park for visitors. The interpretive staff conduct outreach programs for local communities, provide curriculum-based educational programs for school groups, and organize special events that focus on understanding and appreciating park resources and that promote and foster stewardship of the unique interrelationship between the marine and terrestrial environments. The range of interpretive programs may include glass-bottom boat tours to the coral reefs coordinated with the park's future concessioner, guided walks on the keys, snorkel orientations at Convoy Point, special topic talks, and slide shows. Working with local schools, primarily 4th through 8th grade students, a full-time park interpreter coordinates an active environmental education program that provides an on-site three-day / two-night environmental learning

experience on Elliott Key. This program uses the Elliott Key visitor contact station for indoor environmental education activities in inclement weather. The interpretive staff also coordinates special events, both on-site-and off-site.

Exhibits at the Dante Fascell Visitor Center include natural and cultural history displays, illustrations, and text to orient and educate park visitors. Numerous short audiovisual programs are shown in the visitor center to orient visitors to the park and its resources. The visitor center also houses the Everglades Association's bookstore and space for a small concession retail store where visitors could make reservations for boat tours; rent a variety of water sports equipment; and purchase prepackaged food, souvenirs, and convenience items. The visitor center hours of operation are 9:00 a.m. to 5:00 p.m. daily (and open from 12 noon to 5:00 p.m. on Christmas Day).

Every year, about 550 volunteers support the interpretive function at Biscayne National Park. The bulk of this volunteer effort is associated with annual, large-scale events such as "Baynanza," which is a park-sponsored bay cleanup and recycling effort. A smaller number of scheduled volunteers directly support the interpretive operation by providing information at the Dante Fascell Visitor Center.

Maintenance Division

The Maintenance Division is responsible for the operation and maintenance of all park facilities and equipment, including utilities (water storage, wastewater, electrical generating systems, and solid waste systems), buildings, grounds, roads, trails, campgrounds, comfort stations, employee housing, docks, boats, and historically significant structures.

Fifteen full-time employees and up to four temporary employees maintain and manage the physical assets of the park. Besides the facility manager and two facility specialists (one being a regional network position), the maintenance staff includes a mainland supervisor, island supervisor, two marine mechanics, two maintenance mechanics, a utility systems mechanic, a small craft operator, two deck hands, a maintenance worker, and an equipment operator. Maintenance staff is duty-stationed at Convoy Point, but some maintenance personnel visit the keys and other locations in the park daily in the performance of their duties.

FACILITIES

Water Systems

Convoy Point on the mainland coast is served by the City of Homestead municipal water supply. Potable water for visitors is only available at Convoy Point. Visitors are required to bring enough water to meet their needs when visiting areas of the park other than Convoy Point. The water available on Boca Chita Key is not potable.

Biscayne National Park operates potable water systems on Elliott and Adams Keys, primarily for resident park staff and administrative use; there is also potable water for visitors at the restroom building. Four structures are associated with these water systems. The fresh water system on Elliott Key is a 1,100-foot well with brackish water made potable with a reserve osmosis system. The potable water source on Adams Key is a rainwater catchment system with two cisterns and two 16,000-gallon water storage tanks. Associated with the water systems on Elliott and Adams Keys are two water treatment plants and 5,382 feet of waterlines.

Florida regulations require water quality monitoring of potable water systems. To meet this and federal Environmental Protection Agency requirements, the park conducts bacteriological testing twice each month for drinking water. Chlorine residual tests are logged daily at all systems. Storage tanks as well as water taps are tested according to a

water-testing plan on file at the park. The water systems on Elliott and Adams Keys are tested daily.

Utilities

Electrical power for housing and administrative needs at Convoy Point is supplied by an investor-owned public utility, Florida Power & Light Company. The park operates three in-park electrical systems on the keys. A small-scale solar energy system supplies power at Boca Chita Key. Elliott Key is served by two 60-kilowatt diesel generators (but may change to primarily solar power by 2012), and Adams Key electrical needs are provided by a 15 kilowatt photovoltaic system with a 45 kilowatt diesel generator for charging batteries during a total system failure or when the sun is not keeping the batteries charged. The bulk of electric demand is from lights, refrigeration, and air-conditioning for employee housing. Since June 2010, less than 10% of power demand on Adams Key is supplied by diesel generators.

Septic Systems and Solid Waste. The park operates four septic systems with the most complicated one being at Convoy Point where a septic/leach field system with one lift station serves the Dante Fascell Visitor Center and the maintenance and administrative buildings. At Boca Chita Key, a septic/leach system is in place. Elliott and Adams Keys are each served by septic/sand filtration systems.

All of the septic systems currently in operation at the park meet current state codes and regulations. An agreement with neighboring Homestead Bayfront County Park and Marina (owned and operated by Miami-Dade County) provides for effluent from Biscayne National Park to be pumped through a forced main from Convoy Point's sewage system and treated in the county park's newly constructed sewage treatment plant. The park is also seeking U.S. Public Health Service recommendations on the appropriateness of leach field septic systems in the sensitive limestone environment of the keys that have significant water quality issues. There is no direct discharge of wastewater from any of the park systems.

Altogether, there are 2,775 feet of sewerlines on Boca Chita, Elliott, and Adams Keys. Elliott Key has a water treatment plant attached to a covered storage area, and Adams Key has a water treatment plant associated with the cistern, generator building, and toilet facilities. The park does not operate a solid waste landfill. There are no public trash collection facilities on the keys, and island visitors are asked to take their trash with them. Residential trash from the keys is collected by the maintenance staff. Solid waste is transported to Miami-Dade County landfills. Vegetation debris is burned, but the park is exploring the purchase of a chipper as an alternative. The park recycles public and administrative cardboard, aluminum, glass, plastic, batteries, metals, waste oil, and office paper.

Fuel Storage. The park has six fuel storage tanks. Convoy Point has a 6,000-gallon gas and a 4,000-gallon diesel underground storage tank; Elliott Key has two 2,000-gallon aboveground diesel storage tanks; and Adams Key has two 1,000-gallon aboveground diesel storage tanks. Adams Key is 90% solar-powered as of June 2010. The largest fossil fuel use in the park is from operation of the diesel generators on the keys. Park boats are also major consumers of petroleum-based fuels. There is one diesel engine vessel in use at the park; however, gasoline is used to propel most park boats. Gasoline is also used for lawn mowers, all-terrain vehicles, and utility carts. The park uses a diesel-powered tractor for mowing, lifting, and digging. Motorized equipment is used and stored at Convoy Point and on Boca Chita, Elliott, and Adams Keys. The park is making a considerable effort to be free of petroleum-based fuels for electrical generation and exterior lighting. Biscayne is switching to solar-powered energy sources (with diesel backup) whenever possible. The park also has explored the use of synthetic lubricants and will use them in the manufacturer-

recommended manner and when their use does not void the equipment manufacturers' warranty. The park is also planning to replace gasoline utility carts with electric models.

Buildings and Structures

There are 24 park-owned and managed buildings in Biscayne National Park. Six administrative/public use buildings are on the mainland at Convoy Point—the Dante Fascell Visitor Center, the park administration building, the park maintenance building, a duplex housing unit, a hazardous materials storage building, and a fuel pump building. Six of the remaining 18 park buildings are on Boca Chita Key, 7 are on Elliott Key, and 6 are on Adams Key. Boca Chita Key and Elliott Key each have one campground. Picnic facilities are available at Convoy Point and on Adams Key. There are five park residences—one duplex at Convoy Point and four single-family residences on the keys.

Convoy Point Buildings and Structures. The 11,400-square-foot, two-story, Dante Fascell Visitor Center at Convoy Point was constructed in 1993. The 6,240-square-foot second floor provides exhibit and visitor orientation space, a sales area for the park association bookstore, space for a concessioner office and store, and offices for park interpretive staff. A portion of the five, 160-square-foot lower level has been enclosed and includes restrooms, educational learning space, and several small, lockable storage areas. Visitors can obtain park information, purchase materials in the bookstore, and see interpretive exhibits and a video about park history and natural resources and enjoy the picnic facilities.

The 7,900-square-foot park headquarters building is adjacent and connected to the Dante Fascell Visitor Center by a pedestrian causeway bridge. The two-story headquarters building was completed in 1993 and has 6,400 square feet of enclosed office and meeting room space on the second floor and 1,500 square-feet of enclosed space on the first floor. A 4,600-square-foot maintenance shop at Convoy Point was completed in 1993.

Convoy Point Housing— A stilt-structure, duplex housing unit is near the maintenance shop on Convoy Point. The unit has 4,600 square feet of living space on the second floor. One side of the duplex is assigned to a permanent law enforcement ranger, and the other side accommodates seasonal employees or volunteers. The unit was constructed in 1997.

Convoy Point Marinas/Docks— There is one boat marina with two docks directly in front of the Dante Fascell Visitor Center. One dock has eight boat slips; the other stationary dock could be used by the park concessioner. The stationary dock has no slips so four to six vessels could be accommodated at one time, depending on the size of the boats. Three vessels typically use this stationary dock. The Convoy Point marina is used mainly by park staff for administrative purposes, although the boat docks are also used by park cooperators conducting scientific research in the park. Visitors have access to two boat slips at Convoy Point, which are available from 8:00 a.m. to 5:30 p.m. Public use of the Convoy Point docks is infrequent because most visitors access the area by car. The level of accommodation for visitor boats appears to be adequate because Convoy Point is adjacent to Homestead Bayfront Park, which accommodates hundreds of vessels.

Keys Buildings and Structures. Five of the six park buildings on Boca Chita Key are contributing features of the Boca Chita Key Historic District. These buildings are the lighthouse, chapel, picnic pavilion, garage or barn, engine house, and cistern. The sixth building is a public comfort station. Other structures on Boca Chita Key that are contributing features of Boca Chita Key Historic District include a simple arched concrete bridge spanning a dry canal, remnants of a limestone wall that originally enclosed the primary structures in the Boca Chita complex, dry-laid retaining walls, a

cannon resting in a stone base, and a concrete walkway.

Buildings on Elliott Key include a two-story 1,366-square-foot environmental education center, the east and west housing units, comfort station/generator building, water treatment plant with attached storage area, and a maintenance building. Constructed between 1978 and 1980, the environmental education center on Elliott Key is used for a few months of the year.

On Adams Key are two employee residences, the pavilion (a square structure originally designed as an environmental camp but currently used as a shade structure and storm shelter), a water treatment plant and cistern, a generator building, and a comfort station.

Keys Housing— Housing units on Elliott and Adams Keys are single-family units designed and built by the National Park Service. There are two houses on Elliott Key and two houses on Adams Key. The residences on Elliott Key are concrete stilt construction. Built in 1981, each house has two bedrooms and one bath. A concrete stilt construction residence on Adams Key was constructed in 1997 to replace a wooden house destroyed by Hurricane Andrew in 1992. The other residence on Adams Key is a wooden stilt construction residence that was built about 1984. Housing on the keys is required occupancy for visitor protection staff.

Keys Marinas/Docks—There are public docks and mooring facilities at Boca Chita, Elliott, and Adams Keys. Visitors mooring a boat at Boca Chita and Elliott Keys pay a per-night fee. Docking facilities at Adams Key are for day use only, and there is no mooring fee.

There are no docks at Boca Chita Key, but a dredged boat basin or harbor on the north end of Boca Chita has cleats for securing boats on the sea wall. The kidney-shaped harbor is lined with a concrete bulkhead. A concrete slab walkway surrounds the harbor and extends south to the engine house. Harbor capacity at Boca Chita is determined by vessel length. The boat harbor at Boca Chita Key is available for public use 24 hours per day.

Elliott Key Marina has two stationary docks—the public dock has 66 boat slips for public use available 24 hours per day, and the second dock south of the marina is for NPS vessels only.

One T-shaped dock at Adams Key can handle 10 vessels. The Adams Key dock has four reserved spaces for NPS vessels and for vessels belonging to park personnel housed on Adams Key. Public use of the Adams Key dock is for day use only. Visiting boats are moored on the outside of the dock. The park follows the marine tradition of granting safe harbor—granting free and open access to the protected areas at the keys during storms or emergencies.

Campgrounds

There are two campgrounds in Biscayne National Park—one on Elliott Key and one on Boca Chita Key. Individual campsites are not formally designated; however, campsites are generally defined by the presence of a picnic table, and most campsites have fire grills. The Elliott Key campground offers about 20 campsites, and the Boca Chita campground has 25 campsites. Up to two tents and six people are allowed at each campsite. Camping fees are per night and include overnight mooring for private vessels. During peak periods, such as spring and autumn weekends, the campgrounds are often crowded. There is a campground reservation system for group sites but not for individual sites. Campgrounds are available on a first-come, first-served basis; there are no camping overflow facilities Visitors must bring all supplies including fuel, water, ice, food, and convenience items, and must carry out all trash and garbage with them when they leave.

Marine Operations

Vessels. Biscayne National Park operates and maintains approximately 20 vessels. Eight of these are law enforcement craft assigned to individual rangers (although any ranger staff can use any boat and may ride on any boat). Boat maintenance for law enforcement craft is done on a regular schedule by the rangers and by the park marine mechanic.

Four vessels are used by the maintenance staff, four are used by resource management staff to conduct research and monitor resource conditions in the park, and the Interpretation Division uses two. Although funding is limited for boat upkeep and related navigational and safety gear, maintenance on these vessels is performed by the park marine mechanic. The park is developing a cyclic maintenance program to improve the efficiency of vessel repair and maintenance.

Anchorage and Buoys

Anchoring is permitted throughout most of the park, and overnight anchoring is allowed. Overnight anchoring occurs primarily within the sheltered waters of Biscayne Bay. Anchors are dropped on the seagrass bottom.

On the north and south sides of the park, the park boundary is marked with nine buoys. Some of these boundary buoys are illuminated at night. On the north, an illuminated "N" buoy marks the park boundary and lighted "A," "B," and "C" markers show the boundary corners. The southern boundary is further identified with I-beam markers, which are not illuminated. There is a whistle buoy at the park's southeast corner. Lighted towers and regulatory day markers mark the closed area of Legare Anchorage on Florida Reef. Annual maintenance on park buoys is performed. Navigation aids on the Intracoastal Waterway are positioned and maintained by the U.S. Coast Guard.

Navigation Channels / Public Marinas. Miami-Dade County has more registered boats than any other county in Florida. In 1990, 47,082 recreational vessels were registered in the county, and by 1997 the number had increased to 50,213 (Florida Department of Highway Safety and Motor Vehicles, Bureau of Vessel Titles and Registrations, Miami-Dade County). Boat owners and operators from the greater Miami metropolitan area use the waters surrounding Miami and are often within the park boundaries. Boat traffic enters the park on the Intracoastal Waterway or on waterways or channels marked on NOAA Fisheries charts 11463, 11449, and 11445. Other than the Intracoastal Waterway, the waterways in the park are not congressionally authorized navigation channels and are not surveyed for channel depth information by the U.S. Army Corps of Engineers (Atlantic Intracoastal Waterway, Florida Inland Navigation District 2002). Seven channels pass either through the park, penetrate the park from the mainland coast, or approach the park boundary from the mainland coast. Hawk Channel is a natural channel on the seaward side of the keys. Ocean yachts and other watercraft ply the waters of Hawk Channel, pursuing north-south routes between ports on the U.S. Atlantic seaboard and ports in the Caribbean, Mexico, and South America.

Several natural channels lead from Hawk Channel in the Florida Straits to Biscayne Bay on the west side of the keys. In Biscayne National Park these east-west channels are Biscayne Channel, Caesar Creek, and Broad Creek. Biscayne Channel cuts through the northern shoals in the park known as the Safety Valve. Close to the Port of Miami and Miami-Dade County marinas, Biscayne Channel is a popular route from the more protected waters of Biscayne Bay to Hawk Channel and the Florida Straits. NOAA Fisheries charts indicate the approximate controlling depth of Biscayne Channel is 7 feet. Biscayne Channel is marked with lighted buoys at both west and east approaches and with starboard and port day markers along its length.

Caesar Creek, at the southern end of Elliott and Adams Keys, is used by boats traveling between Biscayne Bay and Hawk Channel as well as to the Florida Reef platform. NOAA Fisheries charts describe an approximate 4 foot controlling depth of Caesar Creek Channel. A lighted buoy marks the eastern approach to Caesar Creek, and the length of Caesar Creek Channel is posted with starboard and port day markers. At the extreme southern boundary of the park, Broad Creek, south of Swan Key, is a shallow passage with an approximate controlling depth of only 2 feet.

Bisecting Biscayne Bay from north to south, the Intracoastal Waterway is a segment of the Atlantic Intracoastal Waterway that extends from New England to Key West. The Intracoastal Waterway is maintained by the U.S. Army Corps of Engineers working in concert with the Florida Inland Navigation District. The Florida Inland Navigation District was created by the Florida legislature in 1927 in response to the River and Harbor Act approved by Congress in 1920. The Florida Inland Navigation District enables a partnership between the U.S. government and the State of Florida, whereby the United States agrees to construct and maintain the Intracoastal Waterway and the Navigation District agrees to furnish the necessary rights-of-way and spoil deposit areas (Atlantic Intracoastal Waterway, Florida Inland Navigation District 2002). The Florida Inland Navigation District consists of the 11 counties along the east coast of Florida from Duval to Miami-Dade. The route of the Intracoastal Waterway from Miami south through the park is protected by the keys from high winds and rough waters, other than during severe storms (with the exception of an exposed reach of open water 11 miles in length in Biscayne Bay between Cape Florida and the Ragged Keys). Because of frequent shoaling along its length, repeated dredging is needed to provide the minimum channel for the Intracoastal Waterway. Where the waterway passes through the park, it is dredged to a controlling depth of 7 feet and is about 75 feet wide. The waterway is marked with lights where it enters the park at the north and western park boundaries. There are also lights and day markers on the waterway where the channel crosses the West, Middle, and East Featherbed Banks. Lights also mark spoil areas.

Miami-Dade County operates and maintains two public marinas with navigational easements through the park from Black Point and Homestead Bayfront Marinas. Both navigational channels are 31,000 feet long and 150 feet wide and extend through Biscayne National Park from their respective marina parks on the mainland coast to or toward the Intracoastal Waterway. These channels are dredged to a depth of 4.5 feet. Both the Black Point Marina and Homestead Bayfront Marina easements were granted by the state to Miami-Dade County in 1970. Both easements are preserved through a 1974 memorandum of agreement between the county and the National Park Service, and through a 1979 deed transferring submerged lands to the U.S. government from the state. Both Black Point Marina and Homestead Bayfront Marina Channels are marked with lights at the entrance and are posted with starboard and port day markers.

Homestead Bayfront Marina, managed by the Miami-Dade County Parks, Recreation and Open Spaces Department, is at Convoy Point on the south side of park headquarters and about 1 mile north of the Turkey Point Channel. The marina is 6 miles southwest of Intracoastal Waterway channel markers 5 and 6 in the area known as West, Middle, and East Featherbed Banks. Homestead Bayfront Marina can accommodate vessels up to 50 feet in length. Black Point Park & Marina is about 4.5 miles from the Featherbeds to the south of Cutler Point. Black Point Marina, managed by the Miami-Dade County Parks, Recreation and Open Spaces Department, can accommodate vessels up to 55 feet in length. North of the park, Matheson Hammock Park and Marina is about 3 miles west of the Intracoastal Waterway and almost due west from the tip of Key Biscayne (Miami-Dade County 2002).

Two channels in and near the park boundary are owned and maintained by Florida Power & Light Company—Cutler Point and Turkey Point Channels. Cutler Point Channel provides a navigable waterway through the relatively shallow waters and shoreline shoals of northern Biscayne Bay to the Cutler Power Plant. The Cutler Point Channel passes from the mainland southeast past Chicken Key toward the Intracoastal Waterway. Although outside the park boundary, the alignment of Cutler Point Channel angles toward the park boundary.

In 1973, Florida Power & Light Company began operation of the nuclear power plant at Turkey Point, just south of Convoy Point on Biscayne Bay. To service this facility, Florida Power & Light Company developed a navigation channel from the Turkey Point plant through park waters toward the Intracoastal Waterway. The Turkey Point Channel is maintained by Florida Power & Light Company to a depth of 7.5 feet and is marked with a light at the entrance and starboard and port buoys (FPL 2002).

SOCIOECONOMIC ENVIRONMENT

INTRODUCTION

This section examines the social and economic characteristics pertaining to Biscayne National Park. Given the nature of the activities occurring in the park and bay, both recreational and commercial, it was determined that the most direct economic and social ramifications resulting from these activities is felt within the Miami-Dade County economy. Therefore, for the purpose of this analysis, the socioeconomic region of influence is defined as Miami-Dade County.

Nearby land uses around the park include industrial, rural, and suburban development; farming; environmental restoration areas; undeveloped natural areas; navigation channels; and the coastal waters of Biscayne Bay. The western portion of the park adjoins the urban center of Miami-Dade County with the entire metropolitan area serving as a gateway for visitors to Biscayne National Park from the west. However, Homestead and Florida City are the nearest towns to park headquarters and the main entrance.

DEMOGRAPHICS

Historically, the natural environment in South Florida was not conducive to intensive human habitation. Significant population growth did not occur until the early part of the 20th century. Extensive dredging and filling in the Miami Beach area circa 1920 began a decade of explosive growth in the Miami area (Miami-Dade County 2010). The period immediately after World War II signified another period of rapid expansion as construction materials again became available (Miami-Dade County 2010). Since then, both Miami-Dade County and the state of Florida have consistently experienced high rates of population growth.

During the latter half of the 20th century, the county's population expanded because of high levels of immigration. From the 1960s onward, Cuban refugees began to arrive in significant numbers. In the 1990s, many Haitians immigrated to Miami-Dade County. Immigration from Latin America and the Caribbean has led to population growth. During this time, much of the population growth in the county and the state was attributable to immigration (Miami-Dade County 2010).

The percentage of foreign-born residents in Miami-Dade County was 51 in 2009–13 (U.S. Census Bureau 2014a). Among population five years old and over, 72% spoke a language other than English at home. Of this percentage, 64% spoke Spanish (U.S. Census Bureau 2014a).

The resident population of Miami-Dade County grew 88.8% between 1950 and 1960, marginally higher than the state growth rate of 78.6% over the same period (U.S. Census Bureau 2000). As shown in table 10, the rate of growth within the county roughly mirrored that of the state, ranging between 16% and 35%. Between 1960 and 2010, Florida gained more than 9.0 million residents. In 2014, Florida's population of 19.9 million residents ranked third in the nation behind California and Texas (U.S. Census Bureau 2014b). Miami-Dade County registered a population increase of 991,395 residents, or nearly 61% between 1980 and 2013.

TABLE 10. POPULATION OF MIAMI-DADE COUNTY AND FLORIDA 1960–2010

	Miami-Dade County	Change from Previous Decade	Florida	Change from Previous Decade
1960	935,047	88.8%	4,951,560	78.6%
1970	1,267,792	35.5%	6,789,443	37.2%
1980	1,625,781	28.1%	9,746,324	43.5%
1990	1,937,094	19.1%	12,937,926	32.7%
2000	2,253,362	16.3%	15,982,378	23.5%
2010	2,496,435	10.8%	18,801,310	17.6%
Projected				
2020	2,761,156	10.60%	25,912,458	37.82%
2030	3,009,309	8.99%	28,685,769	10.70%

Source: U.S. Census Bureau 1980–2010; Florida Legislature 2010a

TABLE 11. ESTIMATED POPULATION OF MIAMI-DADE COUNTY AND FLORIDA 2000–13

	Miami-Dade County	Percent change from previous year	Florida	Percent change from previous year
2000	2,258,765		16,047,118	
2001	2,294,643	1.59%	16,353,869	1.91%
2002	2,328,122	1.46%	16,680,309	2.00%
2003	2,352,658	1.05%	16,981,183	1.80%
2004	2,381,215	1.21%	17,375,259	2.32%
2005	2,413,583	1.36%	17,783,868	2.35%
2006	2,438,702	1.04%	18,088,505	1.71%
2007	2,453,567	0.61%	18,277,888	1.05%
2008	2,478,745	1.03%	18,423,878	0.80%
2009	2,500,625	0.88%	18,537,969	0.62%
2010	2,505,379	0.19%	18,843,326	1.65%
2011	2,554,766	1.97%	19,057,542	1.14%
2012	2,591,035	1.42%	19,317,568	1.36%
2013	2,617,176	1.01%	19,552,860	1.22%
Average percent change		1.14%		1.53%

Source: U.S. Census Bureau, American Community Survey 1-Year Estimates Table B01003

As of 2013, Miami-Dade County, with an estimated population of 2.6 million, was the most populous county in Florida and constituted 13.4% of the population of the state (Florida Legislature 2014a). Between 2000 and 2014, the county's population increased 13.8%, while Florida's population increased 18.1% to a total of over 19 million residents. In 2010, the number of persons per square mile in the county was 1,315, while the statewide average was 351 per square mile (U.S. Census Bureau 2010a).

Although lower in number than the population gains throughout the county between 2000 and 2010, the gateway communities of Florida City and Homestead grew faster. Homestead's population increased by 47% to 60,512 residents and Florida City's population increased by 30% to a population of 11,245 (U.S. Census Bureau 2010a).

The projected population trend for Miami-Dade County is significant. It is projected that population will increase to approximately 2.8 million by 2020 and 3.0 million by 2030 (Florida Legislature 2014a).

In addition to its year-round residents, South Florida experiences a substantial seasonal population of retirees escaping winter in the more northern states and attracted by the region's tropical climate. This population is generally older.

LOCAL ECONOMIC BASE

The leading industries for Miami-Dade County for 2013 were educational services, and health care, and social assistance at 19%; retail trade at 13.1%; and professional, scientific, and management, and administrative and waste management services at 12.8% for those civilians employed over the age of 16, out of an civilian estimated employed population of 1,190,891 (U.S. Census Bureau 2014c).

About 80% of those employed in Miami-Dade County work for private companies. The most common occupations for Miami-Dade County are: management, professional, and related occupations at 31%; sales and office occupations at 29%; service occupations at 21%; production, transportation, and material moving at 10.5%; and natural resources, construction, and maintenance at 9% (U.S. Census Bureau 2014c).

In a study conducted in 2004, it was estimated that Biscayne Bay activities contributed nearly $12.7 billion in output, $6.3 billion in income, 137,600 jobs, and $627 million in tax revenue to Miami-Dade County that year. These figures represent 15% of total output produced in the county, 10% of all income, 11% employment, and 11% of taxes, licenses, fees, and similar revenues for the entire county (Hazen and Sawyer 2005).

As shown in table 12, Miami-Dade County tends to a service and trade-oriented economy with major employers that include administration, support, and other services; retail and wholesale trade; health care; lodging and food services; and professional, scientific, and technical services (U.S. Census Bureau 2010b). Employment in manufacturing and goods-producing industries has historically provided significantly higher wages than those in service-oriented enterprises. The region has experienced rapid growth in the service sector and stagnation or overall decline in the manufacturing sector. While total employment has increased, per capita income has stalled. A coordinated regional economic development plan is necessary to ensure focus and balance in South Florida's growth (Governor's Commission for a Sustainable South Florida 1995).

Income

In 2013, Miami-Dade County had a per capita personal income of $23,174, nearly 13% below the Florida per capita income of $26,236 (U.S. Census Bureau 2014a).

TABLE 12. HIGHEST MIAMI-DADE COUNTY EMPLOYMENT SECTORS

Industry	Employment
Administration, support, and other services	215,902
Retail trade	123,559
Health care and social assistance	120,152
Accommodation and food services	91,230
Wholesale trade	65,657
Professional, scientific, and technical services	60,642
Manufacturing	40,446

Source: U.S. Census Bureau, 2007 Economic Census. Table EC0700A1

The median household income in Miami-Dade County was $43,100 compared to Florida at $46,956, and the nation at $53,046 for 2009–2013, a difference of nearly 23% for Miami-Dade County and the nation (U.S. Census Bureau 2014a).

Commercial Fishing

Commercial fishing has a long history in the bay and has occurred in the park since its inception as a national monument in 1968. The commercial fishing industry in the bay is relatively small scale. The larger commercial fishing vessels are primarily at Black Point Marina, but fishing vessels are also at various other marinas around the bay. The smaller commercial operations in the bay consist of mainly trailered vessels that gain access from other points in or near the park, including Matheson Hammock and Homestead Bayfront Marinas. Commercial fishing continues to be an important local maritime activity for some area residents, but it is declining overall.

Biscayne Bay contributes substantially to the commercial fishing industry. Fish and shellfish, particularly pink shrimp, are harvested in the bay. Biscayne and Florida Bays are important to the lifecycle of commercially harvested fish species, including ballyhoo, barracuda, several grouper species, snapper, several jack species, several shrimp species, and spiny lobster (Hazen and Sawyer 2005).

In the most recent Biscayne Bay commercial fishing report available, Hazen and Sawyer (2005) report that the value of bay-dependent commercially harvested species declined from a 1993 peak of $8.5 million to $1.9 million in 2002. This value is reflective of volume harvested, not a per unit value.

The primary species sought within the park by commercial fishers include finfish (snapper grouper complex, mullet) and invertebrates (stone crab, blue crab, spiny lobster, and bait shrimp). Economically, the most important commercial fishery within the bay is the bait shrimp fishery (NPS 2008).

Spiny lobsters can be trapped from August through March with a permit from the Florida Fish and Wildlife Conservation Commission. Without a permit, lobsters must be harvested by hand or with nets. However, no lobster fishing is allowed in the Biscayne Bay-Card Sound Spiny Lobster Sanctuary. This sanctuary is extensive, covering all park waters west of the eastern edge of the park's keys.

Commercial Boating

Commercial boating, including waterborne commerce and cruise ship services at the Port of Miami, generated $8.2 billion in output, $3.9 billion income, 74,000 jobs, and $331 million in tax revenues and represents 6.2% of Miami-Dade County's economy during the period 1980 to 2004 (Hazen and Sawyer 2005).

Information pertaining specifically to the revenues associated with commercial boating is limited. Instead, most recent economic analyses focus on the wider economic activities of the marine recreation industry such as sportfishing and scuba diving, within which commercial boating is only one element of the associated overall expenditure. However, a study completed by Johns et al. (2001) detailed the economic value of the activities related to reef visitation in Miami-Dade County by examining the individual components of recreational expenditure. The study concluded that, on average, visitor boaters spent $75 per person per day on charter boats and $30 per person per day on party boats while visiting the county's reefs to scuba dive, fish etc. The report concluded that over a 12-month period during 2000–01, contributions to the county economy of $40.8 million and $343,000 were directly attributable to expenditures for charter/party boat fees and glass-bottom boat operators, respectively.

The study concluded that the total visitor expenditures per person per day while participating in reef-related recreational activities in the county amounted to $224 (charter boat) and $194 (party boat) for fishing, and $125 (charter or party boat) for scuba diving. The report concluded that visitors who used the reefs in Miami-Dade County had a total expenditure of $572 million during that same 12-month period.

Another commercial boating use in the bay is represented by towboat companies, several of which operate in the park. In addition, the Intracoastal Waterway, a commercial shipping channel, traverses the bay and the park.

The commercial boating component of the county's marine industry is considered a relatively minor, though important element given the amount of additional revenue that is consequently generated.

Economic Importance of Tourism

For more than a century, the tourism/ visitor industry has been a large employer in Miami-Dade County. In August 2011, the Greater Miami's Leisure and Hospitality sector recorded 107,500 people employed within the industry.

The revenue, employment, and tax aspects of the visitor/tourist industry in Miami-Dade County are significant. In 2013, visitors generated approximately $192 million in tourist-related taxes (GMCVB 2014).

During 2013, it is estimated that 14.2 million visitors spent at least one night in the Miami area and that overnight visitors spent nearly $22.8 billion in direct expenditures. As visitor spending circulated through the local economy, it is estimated that the direct and indirect impact of visitor spending would exceed $34.2 billion. International visitors numbered more than 7.1 million, while domestic visitors reached more than 7 million in 2013. Overall, visitation to the Miami area was up 2.2% in 2013 compared to 2012. Latin America continues to be the largest contributor of international visitors to Greater Miami and the beaches, accounting for a little over 5.0 million visitors in 2013. South America remains the driving force of growth in Latin American visitors to Miami, accounting for more than 3.7 million visitors, up 8.8% in 2013. Of the attractions pursued by these visitors, approximately 10% experienced water sports/activities (GMCVB 2014).

Direct visitor spending increased in 2013 compared to 2009–12. Overall, the average daily expenditure per visitor was $298.85, while the average per person per visit expenditure was $2,235.38.

In 2004, recreation activities generated $3.8 billion in output, $2.1 billion in income, 57,100 in jobs, and $257 million in tax revenues in Miami-Dade County (GMCVB 2008).

The Economic Contributions of Biscayne National Park

There are several ways in which the existence of Biscayne National Park contribute to the economy of the county including benefits from park-related employment and expenditure, commercial activities occurring in the park, recreational visitation (land and water based) as well as increased value of properties near the park.

The annual budget for NPS operations at Biscayne National Park contributes to the regional economy, as spending for utilities, supplies, and services support additional business sales, jobs, and income. These are positive attributes but of relatively minimal significance to the regional economy.

Land-based recreational visitation in the park occurs mostly via the Dante Fascell Visitor Center at Convoy Point near Homestead, Florida. Two other facilities, Homestead Bayfront Park and Marina and Black Point Marina, are commonly used to gain access to the park. Both are county facilities and have fee-based entrance systems, docking and launching fees, and limited visitor service facilities. Expenditures by anglers, boaters, and divers entering the park from these and other facilities are discussed below in conjunction with total water-based recreational activities.

There is only minimal expenditure-oriented economic value associated with the visitor center. There is no entrance fee to the park, and many of the most popular activities conducted by visitors, including shoreline fishing, picnicking, sailboarding, and bicycling, have little or no revenue associated with them. As of early 2015, there are a few boat tours to the park's islands or reefs operating under commercial use authorizations. In the past, snorkeling and scuba tours as well as paddle boat rentals have been offered in the park through concessions. The National Park Service is pursuing concession opportunities for visitors without a boat to access the islands for a fee. Commercial activities would center around the gift/snack shop and a future fee-based tour service (which would operate under a licensed concessioner agreement) to conduct tours and scuba diving/snorkeling trips. About two-thirds of park visitors are estimated to spend several nights in the Florida City / Homestead area. As such, park visitors who stay in a hotel/motel would generate additional secondary economic service-based benefits. Although potentially significant to the Florida City / Homestead economies, this is of minimal importance to the regional economy. Some visitors may spend the night in Homestead / Florida City area hotels to visit both Biscayne and Everglades national parks during one stay.

Water-based recreational visitation includes fishing, boating, and scuba diving in the park, and recreational fishing is among the most popular park activities. In 1997, an estimated 50,000 vessels used the park for a variety of activities. Of that total, it was estimated that almost 30,000 boats participated in fishing activities (NPS 1998b). Pleasure boating and scuba diving are also important recreational activities in the park. Most vessels that use the park are local (i.e., registered within Miami-Dade County).

Another important economic activity within the bay is guided sportfishing, primarily for bonefish. In smaller boats, hired guides take one or two customers, mainly to the flats on the east or west sides of the bay. The number of guides actively working in the park is estimated at about 12 full-time guides and 36 part-time guides, based on interview data (EDAW 2003). A 2001 study (Johns et al.) estimated expenditures for recreational fishing and scuba diving at the many reefs in the waters of Miami-Dade County. The reefs of Biscayne National Park, situated east of Boca Chita, Elliott, and Adams Keys, are part of a 150-mile-long chain of coral reefs extending down through the lower Florida Keys. Anglers and divers were surveyed regarding many aspects of the expenditures incurred before, during, and after their recreational activities. Typical trip expenditures could include private

transportation, groceries, take-out food, restaurants and bars, lodging, boat fuel, party/charter fees, access fees, dock fees, guide fees and charges, and equipment rental and purchases. Because of the difference in economic power of a visitor dollar compared to a resident dollar, estimated daily expenditures were broken down by resident/visitor status. It was estimated that the average resident daily trip expenditures when fishing or scuba diving/snorkeling totaled $276 and $219, respectively. Johns et al. (2001) concluded that direct resident fishing and scuba diving expenditures totaled $165 million and $110 million, respectively, for the 12-month period of the study. Average visitor daily trip expenditures when fishing totaled $114 (own/friend's boat), $225 (charter boat), or $194 (party boat). Scuba diving/snorkeling expenditures totaled $87 (friend's boat) or $125 (charter boat). Total direct visitor expenditures (fishing, boating, and scuba diving/snorkeling) totaled $572 million for the 12-month period of the study. Using the Johns et al. study as a guide to typical daily marine recreation expenditures in the county and the park, in conjunction with 1997 boat traffic estimates, it is evident that direct marine recreational expenditures in the park is substantial.

In 2013, an estimated total annual visitor spending of $29.4 million was associated with the 486,848 recreational visits to the park with the bulk of that spending conducted by nonlocal visitors ($29.03 million) staying overnight in area motels, hotels, and camping (NPS 2014). The visitor spending supported an estimated 370 jobs, with an estimated labor income of $15 million in the regional economy. These estimates may not fully account for the seasonal employment and income effects associated with the private and commercial recreation/entertainment operations functioning in the park. Although the jobs supported by park visitor spending represent a negligible percentage of the total regional employment, the visitor spending and jobs supported are important to many businesses and communities around the park, as well as to the future concession operations and fishing outfitters whose activity are directly tied to the park.

Over the 30-year period 1980–2010, recreational use of the park has fluctuated dramatically. In the last decade, between 2000–10 annual visitation ranged from 393,151 to 686,062. It is estimated that on average, visitors spent $128.29 per party per night. Total visitor spending was $29.41 million dollars in 2013 (table 13). This includes spending in sales, income, and jobs in businesses selling goods and services directly to park visitors.

The total effects figures shown in table 14 are the sum of the

- direct effects accrued largely to tourism-related business in the area
- indirect effects accrued to a broader set of economic sectors that serve these tourism businesses
- induced effects that are the impacts of household expenditures from the income earned in a directly or indirectly affected industry

The direct effects of the $29.41 million spending captured from Biscayne visitors were $22.0 million in sales (output), $8.9 million in labor income (wages and salaries), $14.1 million in value added, and 249 jobs supported. As visitor spending circulated through the local economy, an additional $16.8 million in sales, $6.3 million in labor income, $10.7 million in value added, and 125 jobs were created in indirect effects (table 14).

In 2006, economic benefits represented a park benefit-to-cost ratio of more than 4 to 1, meaning that for every dollar spent by the park in its annual budget, more than $4 were generated in the local economy (NPCA 2006).

TABLE 13. VISITS AND ESTIMATED SPENDING BY VISITOR SEGMENT, 2013

	Day Trips	Motel	Camp	Total
Recreation Visits	210,118	245,991	30,739	486,848
Visitor Party Nights in Area	73,240	138,381	17,647	229,268
Average Spending Per Night	$56.33	$168.71	$109.94	$128.29
Total Visitor Spending (000s)	$4,125	$23,347	$1,940	$29,412
Percent of Spending	14%	79%	7%	100%

Source: NPS Visitor Spending Effects Model

TABLE 14. DIRECT AND TOTAL EFFECTS OF VISITOR SPENDING, 2013

	Total
	Direct Economic effects
Output ($000's)	$22,042
Labor Income ($000's)	$8,884
Jobs	249
Value added ($000's)	$14,088
	Total Economic Effects
Output ($000's)	$38,884
Labor Income ($000s)	$15,185
Jobs	374
Value added ($000's)	$24,775

Source: NPS Public Use Statistics Office, NPS Visitor Spending Effects model

CHAPTER 4
Environmental Consequences

INTRODUCTION

The National Environmental Policy Act requires that environmental documents discuss the environmental impacts of a proposed federal action, feasible alternatives to that action, and any adverse environmental effects that cannot be avoided if a proposed action is implemented. In this case, the proposed federal action would be the adoption of a general management plan for Biscayne National Park. The following portion of this document analyzes the environmental impacts of implementing the original alternative 1 (no action) with minor updates and seven action alternatives on natural resources, cultural resources, visitor experience, socioeconomic environment, and park operations. The analysis is the basis for comparing the beneficial and adverse impacts of implementing the alternatives.

Because of the general, conceptual nature of the actions described in the alternatives, the impacts of these actions are analyzed in general qualitative terms. Thus, this environmental impact statement should be considered a programmatic analysis. If and when site-specific developments or other actions are proposed for implementation subsequent to this general management plan, appropriate detailed environmental and cultural compliance documentation will be prepared in accord with NEPA and NHPA requirements.

This chapter begins with a description of the methods and assumptions used for each topic. Impact analysis discussions are organized by alternative and then by impact topic under each alternative.

Each alternative discussion also describes cumulative impacts and presents a conclusion. At the end of each alternative, there is a brief discussion of unavoidable adverse impacts; irreversible and irretrievable commitments of resources; the relationship of short-term uses of the environment and the maintenance and enhancement of long-term productivity, energy requirements, and conservation potential. The impacts of each alternative are briefly summarized in table 5, at the end of the "Chapter 2: Alternatives, Including the Preferred Alternative" section.

CLIMATE CHANGE

The impacts of climate change on the park are not expected to differ among the alternatives, and the lack of qualitative information about climate change effects adds to the difficulty of predicting how these impacts will be realized in the park. For example, mangroves may be impacted by sea level rise, and storm frequency and intensity may impact cultural resources and visitor amenities. Likewise, global-scale stressors such as climate change and ocean acidification can affect coral reefs in many ways, including altering calcification rates and increasing prevalence of bleaching and disease. Few NPS management actions exist that would directly reduce the effects of climate change and ocean acidification. However, taking actions to protect coral reefs from other pressures such as overfishing; land-based sources of pollution; and physical damage from fishing gear, anchoring, and vessel groundings might increase reef resiliency, potentially delaying the effects of global stressors such as climate change and ocean acidification (Jackson 2014). Thus protection of coral reefs is an important management action incorporated into all action alternatives to varying degrees based on zoning schemes.

The range of variability in the potential effects of climate change is large in comparison to what is known about the future under an altered climate regime at the national seashore in particular, even if larger- scale climatic patterns, such as increases in air and water

temperature, increased seasonal precipitation, and more frequent severe thunderstorms, have been accurately predicted for the Atlantic Coast (Loehman and Anderson 2009). Therefore, the potential effects of this dynamic climate on national seashore resources were included in "Chapter 3, Affected Environment." However, they will not be analyzed in detail in "Chapter 4, Environmental Consequences" with respect to each alternative because of the uncertainty and variability of outcomes, and because these impacts are not expected to differ among the alternatives.

Although many specific effects of climate change and the rates of changes are not known at the present time, additional data and climate change modeling will become available during the life of this General Management Plan. The best available scientific climate change data and modeling will be incorporated into specific management planning, decisions, or actions that may be taken under any of the alternatives described in this plan.

CUMULATIVE IMPACT ANALYSIS

A cumulative impact is described in CEQ regulation 1508.7 as follows:

> *Cumulative impacts* are incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other action. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

To determine potential cumulative impacts, other projects within and surrounding Biscayne National Park were identified. The area included Miami-Dade County and the state of Florida. Projects were identified by discussions with the park, federal land managers, and representatives of county and town governments. Potential projects identified as cumulative actions included any planning or development activity that was currently being implemented or would be implemented in the reasonably foreseeable future. Impacts of past actions were also considered in the analysis.

These actions are evaluated in conjunction with the impacts of each alternative to determine if there are any cumulative impacts on visitor use or a particular natural, cultural, or socioeconomic resource. Because most of these cumulative actions are in the early planning stages, the qualitative evaluation of cumulative impacts was based on a general description of the project.

Past Actions

Tree cutters from the Bahamas logged mahogany trees on the keys for ships. Early settlers on Elliott Key cleared the native forests to plant key limes and pineapples.

When Biscayne Bay was being considered for national monument designation, many of the keys were privately owned. At one time, the owner of Elliott Key bulldozed a road down the length of the key. This became known as "Spite Highway." The owner of Boca Chita Key built a 65-foot-tall structure resembling a lighthouse although it never held a light. Other keys also contain remains of past ownership, such as the Jones homesite on Porgy Key and the Sweeting Homestead on Elliott Key.

Establishment of Biscayne National Monument and the subsequent expansion as Biscayne National Park have allowed the majority of the waters and keys of Biscayne Bay to be protected as part of the national park system. Likewise, several marine protected areas in the immediate vicinity have also been established by various agencies and organizations. This has resulted in beneficial impacts on terrestrial and marine

communities and recreational experience opportunities.

Maritime Heritage Trail. The park has recently developed a new cultural history component to its interpretive programs. The Maritime Heritage Trail (an underwater snorkeling/scuba experience) facilitates visitor access to six historic shipwreck sites within the park waters. Mooring buoys have been installed to reduce visitor impacts. Historic documentation and interpretive materials for each site have been produced. In the future, the park may consider adding additional historic shipwrecks and other maritime sites (such as Fowey Rocks Lighthouse) or even terrestrial maritime sites to the maritime heritage trail.

Present Actions

Fishing. Both recreational and commercial fishing has occurred in the park. Commercial fishing refers to fishing that involves the sale of the harvest. This is not to be confused with commercial guided fishing, which does not involve the sale of the harvest. Commercial guided fishing is defined as "fishing from a vessel carrying a passenger for hire who is engaged in recreational fishing." These definitions can be found in section 2101 of Title 46 *United States Code*. The park would continue monitoring fish populations, as identified in the *Fishery Management Plan* (2014). All actions concerning fishing in the park would be implemented in accordance with the *Fishery Management Plan* (2014) and after consulting with the FWC regarding all areas except the marine reserve zone where fishing would not be allowed. The new park-specific State of Florida fishing regulations have yet to be drafted, and the schedule for their approval and establishment is unknown at this time. Because of the unknown date of establishment, the cumulative impacts of the *Fishery Management Plan* cannot be determined for the short term including impacts on visitor use and experience. In the long term, these regulations are anticipated to have beneficial impacts to fisheries, visitor experience, targeted invertebrate species, and benthic habitats and communities due to eventual phase-out of commercial fishing including shrimp trawling and establishment of a no-trawl zone. The long-term socioeconomic impacts of phasing out commercial fishing in the park are expected to be realized with the anticipated implementation of the *Fishery Management Plan* and are assessed in that plan. For more information on the *Fishery Management Plan*, please visit http://www.nps.gov/bisc/parkmgmt/fishery-management-plan.htm.

Alternative Energy. The park has completed the installation of solar power equipment on Adams Key that has reduced the need for diesel-engine generated power by 90%. The park is seeking funding to install solar panels on Elliott Key to reduce the use of diesel-powered generators.

Black Point Jetty. Adjacent to Black Point Marina County Park, Black Point Jetty is owned by Biscayne National Park. A memorandum of agreement with the county outlines each party's responsibilities for facility maintenance.

Turkey Point Power Plant. This electrical generating plant complex operates just outside park boundaries on the mainland south of Convoy Point. As of 2014, it consists of five generating units: two oil-fired units (units 1 and 2), two nuclear units (units 3 and 4), and a natural gas plant (unit 5). The current plans for the Turkey Point Power Plant complex include the addition of two new nuclear reactors (units 6 and 7) that are currently in the permitting stage. The National Park Service is a cooperating agency with the Nuclear Regulatory Commission in the environmental review of the proposed plant. Environmental review of the existing plant site by the state and federal regulatory agencies has documented the existence of a high salinity plume in the Biscayne Aquifer under the cooling canals extending off-site in all directions. The current application for units 6 and 7 includes a water withdrawal system (called radial collector wells), which is not

required and, if permitted, will extend to the park boundary at the geographical feature of Turkey Point. This system would be allowed to remove up to 120 million gallons of water per day for no more than 60 consecutive days a year. The National Park Service remains concerned about the potential environmental impacts from plant construction, the hydrological impacts of the proposed fill source in the federal application, the proposed supplemental water withdrawal, the volume of water removed by the plant complex from the aquifer, and the impacts of sea level rise on the existing plant complex. The National Park Service has no position on the addition of two new nuclear units and is working with the federal and state regulators as well as corporate representatives to review and improve these issues.

Recreational Boating. Both motorized and nonmotorized boating is recognized as an appropriate and popular use of park waters. Some management issues are associated with this activity. Unintentional groundings and propeller scars cause damage to marine environments when boats are driven into water that is too shallow. There are also some conflicts between motorized and nonmotorized (paddling or sailing craft) boaters. Motorized boating also has impacts on the soundscapes of the park. Many agencies and organizations, including the park and the State of Florida, have boater education programs in place to minimize these impacts.

Park Actions. There are many actions being undertaken at the park that are improving natural resources, visitor experience opportunities, and park facilities. Examples of funded projects include maintenance of navigational buoys; implementation of the *Fishery Management Plan* (2014), manatee plan, and wildland fire plan; implementation of a multipark exotic plant management plan; rehabilitation of aged infrastructure; scientific studies, and trail work.

Park infrastructure has been and continues to be built in such a manner as to minimize impacts to the area's rich natural and cultural resources and to contribute to their conservation. One example is the minimal footprint of the Convoy Point grounds for visitor use.

Interagency initiatives are also being supported—such as the *South Miami-Dade Watershed Study and Plan,* the Biscayne Bay *Surface Water Improvement and Management Plan,* the *Lower East Coast Regional Water Supply Plan,* the Biscayne Bay Partnership Initiative, the Southeast Florida Coral Reef Initiative, the *Biscayne Bay Coastal Wetlands Plan*, the USFWS *South Florida Multi-Species Recovery Plan*, reintroduction of rare butterflies, and manatee management.

Future Actions

Long-range actions that are beginning to be implemented would have future impacts on natural resources. The *Comprehensive Everglades Restoration Plan* would restore more natural flows of fresh water in southern Florida when completed. Part of this is the Biscayne Bay Coastal Wetlands Project that would concentrate on preserving or restoring the wetlands along the shore of Biscayne Bay. The Coral Reef Initiative would protect corals and coral reefs throughout the region.

The developed area of Miami-Dade County is continuing to grow according to city and county plans, especially north and west of the park. Such development would continue to reduce the availability of natural habitats in the geographic region outside park boundaries. Adjacent development also increases the potential for hydrologic alterations and increases the potential for urban runoff and associated impacts on the water quality of Biscayne Bay. It is also expected that that this growth would lead to additional demands for recreation in the park, including increases in fishing and boating activities as well as associated impacts on park fishery resources, endangered sea life, submerged aquatic resources (including corals and seagrass beds), and submerged cultural

resources. An increase in recreational use could result in increased levels of conflict between recreational user groups and increased demands on park operations to manage an increasing number of visitors.

METHODS AND ASSUMPTIONS FOR ANALYZING IMPACTS

Impact analysis and the conclusions in this chapter are largely on the review of existing literature and studies, information provided by experts in the National Park Service and other agencies, and park staff insights and professional judgment. The team's method of analyzing impacts is further explained below. It is important to remember that all the impacts have been assessed assuming mitigation measures have been implemented to minimize or avoid impacts. If mitigation measures described in "Chapter 2: Alternatives, Including the Preferred Alternative" were not applied, the potential for resource impacts and the magnitude of those impacts would increase.

Director's Order 12: *Conservation Planning, Environmental Impact Analysis, and Decision-making*, presents an approach to identifying the duration (short or long term), type (adverse or beneficial), and intensity or magnitude (e.g., negligible, minor, moderate, or major) of the impact(s), and that approach has been used in this document. Where duration is not noted in the impact analysis, it is considered long term. Direct and indirect effects caused by an action were considered in the analysis. Direct effects are caused by an action and occur at the same time and place as the action. Indirect effects are caused by the action and occur later in time or farther removed from the place, but are still reasonably foreseeable.

The impacts of the action alternatives describe the difference between implementing the no-action alternative and implementing the action alternatives. To understand a complete picture of the impacts of implementing any of the action alternatives, the discussion must also take into consideration the impacts that would occur under the no-action alternative.

NATURAL RESOURCES

The analysis of natural resources was based on research; knowledge of park resources; and the best professional judgment of planners, biologists, hydrologists, and botanists who have experience with similar types of projects. Information on the park's natural resources was gathered from several sources, including the U.S. Fish and Wildlife Service and site-specific resource inventories for wetlands, wildlife, water quality, and fishery resources. As appropriate, additional sources of data are identified under each topic heading.

Where possible, map locations of sensitive resources were compared with the locations of proposed developments and modifications. Predictions about short-term and long-term site impacts were based on previous studies of visitor and facilities development impacts on natural resources.

For each natural resource impact topic, the description of impacts includes duration and type as described here:

Duration. The duration of the impact considers whether the impact would occur for a short term and be temporary in nature and associated with transitional types of activities and associated impacts, or if the impact would occur over a long term and have a permanent impact on the resource.

Type of Impact. Impacts are evaluated in terms of whether they are beneficial or adverse to the resource. Beneficial impacts would generally be expected to result in improved conditions while adverse impacts would generally be expected to result in deteriorated conditions or the perpetuation of existing conditions that are less than the desired condition.

The impact intensity definitions below assume that mitigation would be implemented.

Fishery Resources and Seabottom Communities

Negligible — Impacts would be at the lowest levels of detection and would have no appreciable impact on resources, values, or processes.

Minor — Impacts would be perceptible, but slight and localized.

Moderate — Impacts would be readily apparent and widespread and would result in a noticeable change to resources, values, or processes.

Major — Impacts would be readily apparent and widespread and would result in a substantial alteration or loss of resources or processes if adverse.

Special Status Species

Through coordination with the U.S. Fish and Wildlife Service and NOAA Fisheries, species of special concern were identified that were generally in or near the park. This included information on each species, including preferred habitat, prey, and foraging areas. Park staff then collected more specific information such as the absence or presence of each species within park boundaries. For special status species, including federally listed species, the following impact intensities were used.

Note: To fulfill NPS obligations under the Endangered Species Act, determinations of effect for the listed species retained for analysis are included below using additional language that corresponds to the Endangered Species Act for the purposes of review by the U.S. Fish and Wildlife Service and NOAA Fisheries.

Negligible — The action could result in a change to a population or individuals of a species or designated critical habitat, but the change would be so small that it would not be of any measurable or perceptible consequence and would be well within natural variability. This impact intensity equates to "may affect, not likely to adversely affect" determination.

Minor — The action could result in a change to a population or individuals of a species or designated critical habitat. The change would be measurable but small and localized and not outside the range of natural variability. This impact intensity equates to a "may affect, not likely to adversely affect" determination.

Moderate — Impacts on special status species, their habitats, or the natural processes sustaining them would be detectable and occur over a large area. Breeding animals of concern are present; animals are present during particularly vulnerable life stages such as migration or juvenile stages; mortality or interference with activities necessary for survival can be expected on an occasional basis, but is not expected to threaten the continued existence of the species in the park. This impact intensity equates to a "may affect, likely to adversely affect" determination.

Major — The action would result in a noticeable effect to viability of a population or individuals of a species or resource or designated critical habitat. Impacts on a special status species, critical habitat, or the natural processes sustaining them would be detectable. Loss of habitat might affect the viability of at least some special status species. Impacts of this intensity may equate to a determination of "take" of individuals or "may affect, likely to jeopardize the continued existence of a species or adversely modify critical habitat for a species."

As explained in detail in "Chapter 3: Affected Environment," climate change is anticipated to alter water and air temperature, water quality, severe weather events, and vegetation and wildlife. The National Park Service is required to protect federally listed species, and by policy, supports species listed by the State of Florida. Climate change may cause alterations in listed species' habitat, breeding and nesting timing and success, predator-prey relationships, and the food web that supports these species. Some of these changes may be difficult to distinguish from other natural processes such as barrier island migration. The park will work with the U.S. Fish and Wildlife Service, NOAA Fisheries, and appropriate state agencies to determine and implement new mitigation or management actions to support species health and population stability as the dynamic effects of climate change become apparent over the life of this general management plan.

Terrestrial and Submerged Aquatic Vegetation

Negligible — The impact on vegetation (individuals and/or communities) would not be measurable. The abundance or distribution of individuals would not be affected or would be slightly affected. Ecological processes and biological productivity would not be affected.

Minor — An action would not necessarily decrease or increase the area's overall biological productivity. An action would affect the abundance or distribution of individuals in a localized area, but would not affect the viability of local or regional populations or communities.

Moderate — An action would result in a change in overall biological productivity in a small area. An action would affect a local population sufficiently to cause a change in abundance or distribution, but it would not affect the viability of the regional population or communities. Changes to ecological processes would be of limited extent.

Major — An action would result in a change in overall biological productivity in a relatively large area. An action would affect a regional or local population of a species sufficiently to cause a change in abundance or in distribution to the extent that the population or communities would not be likely to return to its/their former level (adverse). Significant ecological processes would be altered.

Wetlands

Negligible — No measurable or perceptible changes in wetland size, integrity, or continuity would occur.

Minor — The impact would be measurable or perceptible but slight. A small localized change in size, integrity, or continuity could occur because of short-term indirect impacts such as construction-related runoff. However, the overall viability of the resource would not be affected.

Moderate — The impact would be sufficient to cause a measurable change in the size, integrity, or continuity of the wetland or would result in a small, but permanent loss or gain in wetland acreage.

Major — The action would result in a measurable change in all three parameters (size, integrity, and continuity) or a permanent loss of large wetland areas. The impact would be substantial and highly noticeable.

Soundscapes

Context, time, and intensity together determine the level of impact of an activity. For example, noise for a certain period and intensity would be a greater impact in a highly

sensitive context, and a given intensity would be a greater impact if it occurred more often, or for longer duration. In some cases, an analysis of one or more factors may indicate one impact level, while an analysis of another factor may indicate a different impact level according to the criteria below. In such cases, best professional judgment based on a documented rationale was used to determine which impact level best applies to the situation being evaluated.

Negligible — In all zones, impacts on natural sound environment would be at or below the level of detection, and such changes would be so slight that they would not be of any measurable or perceptible consequence to visitor experience or to biological resources.

Minor —Impacts on the natural sound environment would be detectable, although the impacts would be localized, and would be small and of little consequence to visitor experience or biological resources. Natural sounds would predominate in zones where management objectives call for natural processes to predominate, with human-caused noise infrequent and at low levels. In zones where more human-caused noise is tolerated, human-caused noise would not be so constant that natural sounds could not be heard occasionally. Beneficial impacts would reduce the amount of noise or otherwise improve the natural soundscape by a similar degree.

Moderate —Impacts on the natural sound environment would be readily detectable with consequences over a relatively large area. Beneficial impacts would reduce the amount of noise or otherwise improve the natural soundscape by a similar degree. In zones where management objectives call for natural processes to predominate, natural sounds would predominate, but human-caused noise could occasionally be present at low to moderate levels. In zones where human-caused noise is consistent with desired conditions, this noise would predominate during daylight hours, but would not be overly disruptive to visitor activities in the area. In such areas, natural sounds could still be heard occasionally.

Major — Impacts on the natural sound environment would be obvious and have substantial consequences to visitor experience or to biological resources in the region. Beneficial impacts would reduce the amount of noise or otherwise improve the natural soundscape by a similar degree. In zones where management objectives call for natural processes to predominate, natural sounds would be impacted by human-caused noise sources frequently or for extended periods of time. In zones where human-caused noise is more tolerated, the natural soundscape would be impacted most of the day and make enjoyment of activities in the area difficult.

Duration. A short-term impact occurs only during the construction period or up to three months. A long-term impact continues for more than three months.

CULTURAL RESOURCES

For each cultural resource impact topic, the description of impacts includes duration and type as described here:

Duration. The duration of the impact considers whether the impact would occur for a short term and be temporary in nature and associated with transitional types of activities and associated impacts, or if the impact would occur over a long term and have a permanent impact on the resource.

Type of Impact. Impacts are evaluated in terms of whether they are beneficial or adverse to the resource. Beneficial impacts would generally be expected to result in improved conditions while adverse impacts

would generally be expected to result in deteriorated conditions or the perpetuation of existing conditions that are less than the desired condition.

Impacts on Cultural Resources and Section 106 of the National Historic Preservation Act

In this *Final General Management Plan / Environmental Impact Statement*, impacts on cultural resources are described in terms of duration, type, context, and intensity, which is consistent with the regulations of the Council on Environmental Quality that implement the National Environmental Policy Act. These impact analyses are intended, however, to comply with the requirements of both the National Environmental Policy Act and section 106 of the National Historic Preservation Act. In accordance with the ACHP regulations implementing section 106 of the National Historic Preservation Act (36 CFR 800, *Protection of Historic Properties*). Impacts on cultural resources were also identified and evaluated by (1) determining the area of potential effects; (2) identifying cultural resources present in the area of potential effects that are either listed in or eligible to be listed in the National Register of Historic Places; (3) applying the criteria of adverse effect to affected national register-eligible or listed cultural resources; and (4) considering ways to avoid, minimize, or mitigate adverse effects.

Under ACHP regulations, a determination of either adverse effect or no adverse effect must also be made for affected national register-listed or eligible cultural resources. An adverse effect occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the national register, e.g., diminishing the integrity (or the property's ability to convey its significance) of its location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects caused by the alternatives that would occur later in time, be farther removed in distance, or be cumulative (36 CFR 800.5, *Assessment of Adverse Effects*). A determination of no adverse effect means there is an effect, but the effect would not diminish the characteristics of the cultural resource that qualify it for inclusion in the national register.

CEQ regulations and NPS Director's Order 12: *Conservation Planning, Environmental Impact Analysis and Decision-making* also require a discussion of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact, e.g., reducing the intensity of an impact from major to moderate or minor. Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under the National Environmental Policy Act only. It does not suggest that the level of effect as defined by section 106 is similarly reduced. Cultural resources are nonrenewable resources, and adverse effects generally consume, diminish, or destroy the original historic materials or form, resulting in a loss in the integrity of the resource that can never be recovered. Therefore, although actions determined to have an adverse effect under section 106 may be mitigated, the effect remains adverse.

A section 106 summary is included in the impact analysis sections. The section 106 summary is an assessment of the effect of the undertaking (implementation of the alternative) based on the criterion of effect and criteria of adverse effect found in ACHP regulations.

Archeological Resources

Negligible— Impact is at the lowest level of detection. Impacts would be measurable but with no perceptible consequences. For purposes of section 106, the determination of effect would be "no adverse effect."

Minor — Disturbance of a site(s) results in little loss of integrity. The

determination of effect for section 106 would be "no adverse effect."

Moderate — Site(s) is disturbed but not obliterated. The determination of effect for section 106 would be "adverse effect."

Major — Site(s) is obliterated. The determination of effect for section 106 would be "adverse effect."

Historic Structures and Buildings

Negligible — Impacts would be at the lowest levels of detection—barely perceptible and measurable. For purposes of section 106, the determination of effect would be "no adverse effect."

Minor — Impacts would affect character-defining features but would not diminish the overall integrity of the building or structure. For purposes of section 106, the determination of effect would be "no adverse effect."

Moderate — Impacts would alter a character-defining feature(s), diminishing the overall integrity of the building or structure to the extent that its national register eligibility could be jeopardized. For purposes of section 106, the determination of effect would be "adverse effect."

Major — Impacts would alter character-defining features, diminishing the integrity of the building or structure to the extent that it would no longer be eligible to be listed in the national register. For purposes of section 106, the determination of effect would be "adverse effect."

Cultural Landscapes

Negligible — Impacts would be at the lowest levels of detection—barely perceptible and measurable. For purposes of section 106, the determination of effect would be "no adverse effect."

Minor — Impacts would affect character-defining features or patterns but would not diminish the overall integrity of the landscape. For purposes of section 106, the determination of effect would be "no adverse effect."

Moderate — Impacts would alter character-defining features or patterns, diminishing the overall integrity of the landscape to the extent that its national register eligibility would be jeopardized. For purposes of section 106, the determination of effect would be "adverse effect."

Major — Impacts would alter character-defining features or patterns, diminishing the overall integrity of the landscape to the extent that it would no longer be eligible to be listed in the national register. For purposes of section 106, the determination of effect would be "adverse effect."

VISITOR EXPERIENCE

This impact analysis evaluated two primary aspects of visitor experience—diversity of visitor activities and visitor services and facilities (including information and education). Analysis is conducted in terms of how the visitor experience might vary by applying different management zones in the alternatives. Although some acreage numbers and percentages are used to provide a relative sense of the amount of area where visitor access and activities might be affected, analysis is primarily qualitative because of the conceptual nature of the alternatives. Consequently, professional judgment was used to reach reasonable conclusions as to the intensity and duration of potential impacts.

Diversity of Visitor Activities

The analysis of impact on activities is based on whether there was a complete loss, addition, expansion, or a change in access to or availability of a recreational opportunity and how proposed management actions and zones would affect visitor opportunities for social interaction, solitude, challenge, adventure, and access throughout the park.

Visitor Services and Facilities

This analysis is based on whether there would be a change in the availability of visitor services or facilities provided by the National Park Service and commercial services, including information, education, recreation, transport, or other visitor support services resulting from proposed management zone application or other actions.

Duration. The duration of the impact considers whether the impact would occur for a short term and be temporary in nature and associated with transitional types of activities, or if the impact would occur over a long term and have a permanent impact on visitor experience such as no fishing in the marine reserve zone.

Type of Impact. Impacts are evaluated in terms of whether they are beneficial or adverse to visitor experience. Beneficial impacts would provide greater availability of a recreational opportunity or educational program or other services and types of experiences. Adverse impacts would reduce access or availability to these facets of visitor experience.

Intensity. The intensity of the impact considers whether the impact on visitor experience would be negligible, minor, moderate, or major.

> **Negligible impacts** are impacts considered not detectable to the visitor and would have no discernible effect.
>
> **Minor impacts** are impacts that would be slightly detectable but not expected to have an overall effect on the visitor experience.
>
> **Moderate impacts** would be clearly detectable by the visitor and could have an appreciable impact on visitor experience.
>
> **Major impacts** would have a substantial and noticeable impact on the visitor experience or could permanently alter substantial aspects of the visitor experience.

NPS OPERATIONS AND FACILITIES

The impact evaluation was based on a qualitative evaluation of the impacts on park operations and facilities from changes in providing visitor and administrative facilities, services, or programs under each of the alternatives. Impacts were determined by examining the effects of changes on staffing, infrastructure, facilities, and services. The analysis is more qualitative rather than quantitative because of the conceptual nature of the alternatives. Consequently, professional judgment was used to reach reasonable conclusions as to the intensity, duration, and type of potential impact.

Duration. Short-term impacts would be less than one year in duration. Long-term impacts would extend beyond one year.

Type of Impact. Beneficial impacts would improve park operations and facilities. Adverse impacts would negatively affect park operations and facilities and could hinder the park's ability to provide adequate services, equipment, and facilities to visitors and staff. Some impacts could be beneficial for some operations or facilities and adverse or neutral for others.

Intensity. The intensity of the impact considers whether the impact would be negligible, minor, moderate, or major. Impact

intensities for park operations and facilities are defined as follows:

Negligible — Park operations and facilities would be affected at or below the lower levels of detection, or there would be no measurable change in park operations or facilities.

Minor — Changes in park operations and facilities would be perceptible, although the changes would be slight and localized and would not be expected to have an appreciable impact on the ability of the park or concessioner to provide desired services and facilities.

Moderate — Changes in park operations and facilities would be readily apparent and would have appreciable impacts on park operations that are noticeable to the staff and the public.

Major — Changes in park operations and facilities would be readily apparent and result in substantial changes in park operations that are noticeable to the staff and public and are markedly different from existing operations.

SOCIOECONOMIC ENVIRONMENT

The National Park Service applied logic, experience, professional expertise, and professional judgment to analyze the impacts on the social and economic situation resulting from the implementation of each alternative. Economic data, historic visitor use data, expected future visitor use, and future developments of the park were all considered in identifying, discussing, and evaluating expected impacts.

Assessments of potential socioeconomic impacts were based on comparisons between the no-action alternative and each of the action alternatives.

Duration. The evaluation of impacts also included an assessment of duration. Distinguishing between short-term and long-term duration was necessary to understand the extent of the identified impacts. In general, short-term impacts are temporary in duration and typically are transitional effects associated with implementation of an action (e.g., related to construction activities) and are less than one year. In contrast, long-term impacts might have a permanent impact on the socioeconomic environments, and their impact extends beyond one year (e.g., operational activities).

Type of Impact. With respect to economic and social impacts, few standards or clear definitions exist as to what constitute beneficial changes and those considered adverse. For example, rising unemployment is generally perceived as adverse, while increases in job opportunities and average per capita personal income are regarded as beneficial. In many instances, however, changes viewed as favorable by some members of a community are seen as unfavorable by others. For example, the impact of growth on housing markets and values may be seen as favorable by construction contractors and many homeowners, but adverse by renters and by local government officials and community groups concerned with affordability. Consequently, some of the social and economic impacts of the alternatives may be described to allow the individual reviewer to determine whether they would be beneficial or adverse (impact is indeterminate with respect to "type").

Intensity. The evaluation of impacts includes an assessment of the intensity of the impacts, as follows:

Negligible — Impacts on socioeconomic conditions would be below or at the level of detection. There would be no noticeable change in any defined socioeconomic indicators.

Minor — Impacts on socioeconomic conditions would be slight but detectable.
Moderate —Impacts on socioeconomic conditions would be readily apparent and

result in changes to socioeconomic conditions on a local scale.

Major — Impacts on socioeconomic conditions would be readily apparent, resulting in demonstrable changes to socioeconomic conditions in the region.

IMPACTS OF IMPLEMENTING ALTERNATIVE 1: NO ACTION

NATURAL RESOURCES

Fishery Resources

Fishery resource management in the park would continue to be governed by state- and park-specific regulations, NPS mandates, and legislation. Commercial and recreational fishing would continue throughout the park. Fishery resource management in Biscayne National Park would continue to manage fishing in park waters with its mandate and responsibility to manage fishery resources in a way that such resources remain unimpaired.

Under the no-action alternative, fishing would continue to be managed according to state regulations in conjunction with park, NPS mandates, and legislation. In addition to state regulations, there would continue to be a ban on lobster harvest within the waters of the bay and a reduced bag limit for lobsters in waters outside the bay during the two-day sport season. Harvesting sponges, ornamental fish, and invertebrates would continue to be banned in all waters throughout the park.

Species in both the bay and the reefs would continue to experience substantial pressures from both commercial and recreational fishing. Some species would continue to be subject to overfishing. These impacts would continue to be adverse and minor to moderate in the long term.

Under this alternative, there would be no change in management of boating in the park. The 1,000 foot slow speed zone along a portion of the mainland would continue to provide some protection to the seagrass beds, which are an important habitat area for both juvenile and adult fish populations. Boating would continue to have an adverse impact on seagrass beds in all other areas of the park. The adverse impacts include seagrass bed scarring. The long-term adverse impacts on fishery resource habitat would likewise have an adverse impact on fish populations. These impacts on habitat would continue to long term, minor to moderate, and adverse.

As no new actions are proposed, there would be no new or additional impacts as a result of implementing the no-action alternative.

Cumulative Impacts. The *Fishery Management Plan* (2014) involves changes in current management strategies for both recreational and commercial fishing activities.

Specific regulatory changes proposed under the *Fishery Management Plan* include: developing park-specific fishing regulations (in conjunction with the FWC) to increase the abundance and average size of targeted fish and invertebrate species within the park by at least 20% over current conditions and over conditions in similar habitat outside the park; elimination of the two-day lobster sport season; prohibition of the use of an air supply or gear with a trigger mechanism while spearfishing; phasing out commercial fishing via the requirement that all commercial fishers must purchase a limited-entry, special use permit from the park superintendent. The permit would be permanently nontransferable, would require annual renewal, and would be "use or lose" such that a permit could not be renewed if (1) it was not renewed the previous year, or (2) no catch was reported in the previous year; establishment (by the FWC) of coral reef protection areas to delineate coral reef habitat on which lobster and crab traps could not be deployed. Traps within the coral reef protection areas could be moved outside area boundaries authorized by the FWC or park staff or other authorized personnel. Additionally, the trap number from traps observed within coral reef protection areas would be recorded, and traps with three or more recorded violations could be confiscated from park waters; proposal of a

no-trawl zone within the bay, in which commercial shrimp trawling would be prohibited. This zone would serve to protect juvenile fish and invertebrates commonly caught as by-catch in trawls, as well as protect essential fish habitat. For more information on this plan, please visit http://www.nps.gov /bisc/parkmgmt/fishery-management-plan.htm.

With implementation of the *Fishery Management Plan*, the park anticipates the current condition of fishery resources would improve and the adverse impact of fishing on habitat within the park would be reduced. The long-term impacts of the *Fishery Management Plan* (2014) on fishery resources in the park would be beneficial to park fish and fish habitats due to the proposed actions and the phase-out of commercial fishing. The adverse impacts on fish habitat associated with the current management of boating in the park would continue. Under this alternative, the beneficial impacts on fishery resources associated with the *Fishery Management Plan* (2014) would be limited to what the plan proposes.

The United States Coral Reef Task Force, created in 1998, was established to lead U.S. efforts to protect, restore, and promote the sustainable use of coral reef ecosystems. These efforts include but are not limited to reducing and mitigating coral reef degradation from pollution, overfishing, and other causes. The task force has identified fundamental themes to guide immediate and sustained national action. These themes include quickly reducing the adverse impacts of human activities on coral reefs and associated ecosystems. Specific actions that could be taken have not been proposed. However, if the initiatives of the task force are fully implemented, the impacts of these activities would probably be beneficial for the coral reef system in the park. Full implementation of the task force's recommendations would also probably cause the park to modify current management approaches to incorporate the recommendations. Until any recommendations take effect, coral reefs would still be subject to recreational activities that are harmful to the ecosystem. These impacts would continue to be long term, adverse, and minor to moderate.

The expanded developed area according to city and county plans with its associated population increase is expected to continue and could cause additional fishing pressure on fish populations in the park—a long-term adverse impact.

The no-action alternative would result in the continuation of adverse impacts on fish and fish habitats, but would not result in any new/additional impacts. Because there would be no project-related contribution to the impacts of other past, present, and future actions, this alternative would not have any new contribution to cumulative impacts.

Conclusion. Under the no-action alternative, impacts on park fishery resources and fish habitat caused by boating and fishing in the park would continue to be adverse, minor to moderate, and long term, but there would be no additional impacts caused by implementing this alternative. There would be no project-related cumulative impacts.

Threatened and Endangered Species

Management actions under the no-action alternative would continue to support populations of threatened and endangered species in the park. The park would continue to coordinate with the U.S. Fish and Wildlife Service and NOAA Fisheries regarding management actions related to the following threatened and endangered species, as necessary.

Manatee. The 1,000-foot-wide slow speed zone that extends along the mainland shoreline from Black Point County Park south to Turkey Point would remain as a manatee protection area. This setback distance was established in cooperation with the state and Miami-Dade County and is consistent with setback distances outside park boundaries.

Slow speed zones are designed to provide boat operators sufficient time to react when manatees are observed, reducing the potential of striking the animals. The slow speed zone would continue to have a long-term, beneficial impact on the population of manatees in the park.

As no new actions are proposed, there would be no new or additional impacts as a result of implementing the no-action alternative.

Section 7 Determination of Effect — Protection measures already in place have minimized potential impacts to manatee from boat strikes. The determination of effect is "no effect" for manatee under a continuation of the no-action alternative.

Sea Turtles. Existing impacts include the potential for collisions with boats, strangulation and entanglement with marine debris (including lobster and crab traps), hook-and-line fishing, and vessel groundings on sea turtle foraging habitat (coral and seagrass), which may adversely affect sea turtles, particularly loggerhead, hawksbill, and green species. Leatherback and Kemp's Ridley would be less likely to be affected because they are rarely in the park. Existing long-term, moderate, adverse impacts to sea turtles in park waters would continue.

Known sea turtle nesting beaches on Elliott Key would not be closed, but these beaches receive little use during nesting season. Park staff would continue to install mesh screening over nests to protect the nests from predation, particularly by raccoons. These management activities would continue to have a long-term, beneficial impact on nesting turtles in the park.

As no new actions are proposed, there would be no new or additional impacts as a result of implementing the no-action alternative.

Section 7 Determination of Effect— Sea turtles continue to be impacted by boating, fishing, and marine debris. Loggerhead, hawksbill, and green species are more likely to experience these impacts because they are more frequently found in park waters. The determination of effect is "may affect, likely to adversely affect" for sea turtles under a continuation of the no-action alternative.

American Crocodile. Most of the mangrove shoreline would continue to be managed primarily to protect wildlife habitat areas including crocodile habitat. Visitor services and infrastructure would continue to be concentrated at Convoy Point and would remain at or near current levels with the visitor center, designated paths, boardwalk, and jetty. These areas are outside the designated critical habitat. No development within the designated critical habitat would be proposed under this alternative. Impacts on crocodiles from current management approaches, development, and visitation patterns would continue to be adverse but negligible in the long term.

As no new actions are proposed, there would be no new or additional impacts as a result of implementing the no-action alternative.

Section 7 Determination of Effect— Shoreline mangrove habitat within the park is well protected. The determination of effect is "no effect" for American crocodile under a continuation of the no-action alternative.

Smalltooth Sawfish. Under this alternative, relatively unrestricted boating and fishing would continue throughout most of the park and their related impacts to smalltooth sawfish would persist including potential for entanglement in marine debris and bycatch. These impacts would be expected to continue to have a long-term, minor to moderate, adverse impact on smalltooth sawfish.

As no new actions are proposed, there would be no new or additional impacts as a result of implementing the no-action alternative.

Section 7 Determination of Effect— Smalltooth sawfish and their habitat would continue to be impacted by fishing. The determination of effect is "may affect, likely to adversely affect"

for sea smalltooth sawfish under a continuation of the no-action alternative.

Schaus Swallowtail Butterfly and Miami Blue Butterfly. Habitat for these two species is primarily focused on Adams Key and Elliott Key. Adams Key would continue to have a developed area that includes a dock, trail, picnic and restroom facilities, a ranger station, and park residential area. The developed area would remain on the southern shore and largely outside the hardwood hammock and away from preferred butterfly habitat. On Elliott Key, the trail that runs the length of the island also runs through the hardwood hammock. Under this alternative, no development would be proposed that would impact butterfly habitat on Elliott Key. Existing long-term, negligible adverse impacts would persist on Adams Key and Elliott Key due to previous modifications of the natural environment and visitor uses.

Old Rhodes and Totten Keys would continue to be managed to preserve natural resources with minimal human-caused impacts. Swan Key would continue to be a sensitive resource area and managed to protect critical ecosystems, habitats, and natural processes. Access to Swan Key would be tightly controlled and limited to permitted research activities. These natural habitats would continue to be a long-term, beneficial impact to the listed butterfly species.

The continued potential for disturbance to either the butterfly or its habitat throughout the park would be negligible. Weather-related phenomena would remain the greatest risk to the butterfly under this alternative.

As no new actions are proposed, there would be no new or additional impacts as a result of implementing the no-action alternative.

Section 7 Determination of Effect— Hardwood hammock habitat within the park is well protected. The determination of effect is "may affect, not likely to adversely affect" for Schaus swallowtail butterfly and Miami blue butterfly under a continuation of the no-action alternative.

Stony Corals. Fishing and recreational boating would continue in coral habitat in most of the park, allowing for the possibility of ecological and physical stress to corals from overfishing, fishing debris, anchoring, and/or vessel groundings. The use and maintenance of navigational markers and mooring buoys would continue to protect corals from unintentional vessel and anchor damage. Legare Anchorage would continue to be restricted for in-water activities, providing protection to corals in this area. Management activities under this alternative would continue to have long-term, moderate, adverse impacts on these species.

As no new actions are proposed, there would be no new or additional impacts as a result of implementing the no-action alternative.

Section 7 Determination of Effect— Stony corals would continue to be impacted by fishing, boating, and marine debris. The determination of effect is "may affect, likely to adversely affect" for stony corals under a continuation of the no-action alternative.

Cumulative Impacts. Habitat disturbance or loss is the most common reason for a species to be listed. The establishment of Biscayne National Park has provided a protective refuge for terrestrial- and marine-listed species resulting in long-term beneficial impacts.

The USFWS *Florida Manatee Recovery Plan* and the site-specific county plans are designed in part to reduce boat-related manatee injury and mortality as well as protect habitat areas. The plan endeavors to assure the long-term viability of the Florida manatee in the wild, allowing for threatened status and, ultimately, removal from the federal list of endangered and threatened species. Criteria include reducing threats to manatee habitat from human-caused and natural factors and achieving population benchmarks.

The NOAA Fisheries *Smalltooth Sawfish Recovery Plan (Pristis pectinate)* addresses rebuilding and monitoring the population of the species relative to the Endangered Species Act definition of endangered and threatened species. The strategy has three main objectives that include activities to address both the species' status and the listing factors. The first is to minimize human interactions and the injury and mortality associated with such interactions. The second is to protect and restore smalltooth sawfish habitats. The third objective is to ensure that smalltooth sawfish abundance increases substantially and reoccupies areas from which they had previously been extirpated.

The USFWS *South Florida Multi-Species Recovery Plan* outlines recovery objectives to maintain and enhance the structure, function, and ecological processes of federally listed species found in South Florida. These include sea turtles, American crocodile, and Schaus swallowtail butterfly found within Biscayne National Park.

Biscayne National Park completed the *Final Coral Reef Restoration Plan and Environmental Impact Statement* in 2012, which provides a systematic approach to addressing injuries to coral reefs caused by vessel groundings within the park. The goal of the plan is to provide a systematic approach for creating a stable, self-sustaining reef environment that existed prior to coral damages, such that natural recovery processes can lead to a fully functioning coral reef community.

The NOAA Fisheries Draft Recovery Plan: Elkhorn Coral (*Acropora palmata*) and Staghorn Coral (*A. cervicornis*) (2014) identifies a strategy for rebuilding and assuring the long-term viability of elkhorn and staghorn coral populations in the wild, allowing ultimately for the species' removal from the federal list of endangered and threatened species. The plan addresses actions that can be taken to address ocean warming and acidification impacts on these species, as well as reducing local threats, such as predation, human-caused physical damage, sedimentation, and habitat contamination. Ecosystem-level actions are also recommended to improve habitat quality and restore keystone reef species and functional processes such as herbivory to sustain adult colonies and enable successful , long-term natural recruitment.

Reintroduction efforts of Miami blue butterflies have occurred on Elliott Key in an attempt to restore this species as an experimental population. If successful, this would be a long-term beneficial impact. The monitoring and recovery plan would continue to be implemented.

Following a low population event in 2012, the park and the U.S. Fish and Wildlife Service have worked with the University of Florida to begin a captive breeding and reintroduction program for the Schaus swallowtail butterfly. These butterflies were reintroduced in 2014 and this program is expected to continue. This active management is expected to have a long-term beneficial impact on the Schaus swallowtail butterfly.

The above-mentioned park *Fishery Management Plan* involves changes in current management strategies for both recreational and commercial fishing activities. The park anticipates the current condition of stony corals, sea turtles, and smalltooth sawfish would improve and the adverse impact on benthic habitats within the park would be reduced due to the phase-out of commercial fishing proposed in the *Fishery Management Plan*.

All these measures, including recovery and restoration plans, are consistent with protection measures incorporated into the proposed actions in this *Final General Management Plan / Environmental Impact Statement*. There would continue to be a beneficial impact on threatened and endangered species recovery efforts because there would be no changes to the existing system, which encourages compliance with the plans. The adverse impacts on some

threatened and endangered species would persist as a result of boating, fishing, marine debris, and pre-existing habitat modifications. Under this alternative, the beneficial impacts on threatened and endangered species associated with the above-mentioned efforts would be limited to what the specific plans propose

Both marine and terrestrial federally listed species face threats of climate change. These impacts are described in "Chapter 3, Affected Environment" in the "Submerged Aquatic Communities" section. In addition to the described impacts for submerged species, climate change is also expected to affect terrestrial species through changes in precipitation, air temperature, seasonality, and extreme weather events such as increased frequency of tropical storms.

The no-action alternative would result in the continuation of adverse impacts on some listed species as well as some beneficial impacts, but would not result in any new or additional impacts. Because there would be no project-related contribution to the impacts of other past, present, and future actions, this alternative would not have any new contribution to cumulative effects.

Conclusion. Management under the no-action alternative would continue to support and restore populations of threatened and endangered species in the park. Under this alternative, there would be no new actions that would impact listed species. Existing long-term negligible impacts would persist on manatees, American crocodile, red knot, and butterfly species; therefore, they would have a section 7 determination of no effect. However, sea turtles, smalltooth sawfish, and stony corals would continue to experience long-term, moderate adverse impacts due to the continuation of boating, fishing, and/or marine debris impacts resulting in a section 7 determination of "may affect, likely to adversely affect" for these species. There would be no project-related cumulative effects. The park will continue to coordinate with the U.S. Fish and Wildlife Service and NOAA Fisheries and work to avoid and mitigate any adverse impacts to these species.

Special Status Species, Including State Listed Species

Birds. Arsenicker and West Arsenicker Keys host wading bird colonies including state listed wading birds and state listed white-crowned pigeons, and West Arsenicker also hosts nesting bald eagles. These keys would remain closed to visitors. Actions under this alternative would have no new effect on bald eagle populations, state listed wading birds, or white-crowned pigeons or nesting activity for these species on West Arsenicker Key. Bald eagles have also nested on the mainland south of Black Point.

Under this alternative, no new facilities would be developed on the mainland immediately south of Black Point, and visitation would be expected to continue at current levels. Visitation to the mainland south of Black Point is currently low and would not be expected to increase. If visitation increases to the point that eagle nesting activity might be disturbed the park could close part of the beach south of Petrel Point during nesting season to reduce impacts on the raptors since human disturbance has the potential for nesting birds to inadvertently crush their eggs while fleeing or to temporarily or permanently abandon their nests, thereby exposing the eggs to predators and extreme temperatures. Under this alternative, the long-term impact on bald eagle populations and nesting activity in the park would continue to be beneficial. There would be no new actions that would affect bald eagles.

For state listed birds, the potential for disruption to nesting, roosting, foraging, and/or loafing remains. For birds using low visitation areas, such as the difficult-to-access Jones Lagoon area, the potential for disturbance remains low. Birds using coastal areas adjacent to high use areas (such as Elliott Key, Sands Key, and Boca Chita Key) would continue to be exposed to potential

disturbances of the noise of boat engines and close approaches by people. The National Park Service monitors known waterbird colonies by air and at this time no waterbird colonies are known to exist on Elliott Key. Exposure to human disturbance would therefore likely be limited to roosting, foraging, and resting birds. This exposure could result in an alteration of natural behaviors, including the potential for nesting birds to inadvertently crush their eggs while fleeing or to temporarily or permanently abandon their nests, thereby exposing the eggs to predators and extreme temperatures. Under this alternative, the long-term impact on state listed birds in the park would continue to be long term, negligible and adverse.

As no new actions are proposed, there would be no new or additional impacts as a result of implementing the no-action alternative.

Cumulative Impacts. These species were listed by the state because of adverse impacts of habitat disturbance or loss, which caused a severe reduction in their numbers. The establishment of Biscayne National Park has provided valuable refugia of protected habitat for many species.

At the time this plan was started, bald eagles were federally listed as endangered. They have since been delisted nationally because of widespread population recovery, indicating a long-term beneficial impact on this species.

Because there would be no project-related contribution to the impacts of other past, present, and future actions, projects this alternative would not have any new contribution to cumulative effects.

Conclusion. Under this alternative, existing impacts would persist including both long-term, negligible adverse impacts on some state listed bird species due to visitor-related disturbances and long-term beneficial impacts due to habitat protection. There would be no new or additional project-related impacts caused by implementing this alternative. There would be no project-related cumulative effects.

Terrestrial Vegetation

Under this alternative, no new development would be proposed that would impact terrestrial vegetation. Current visitor facilities and park infrastructure would remain within their current footprint. Some vegetation in the park would continue to be adversely impacted by social trails and trampling. These impacts would continue to be long term, negligible to minor, and adverse.

As no new actions are proposed, there would be no new or additional impacts as a result of implementing the no-action alternative.

Cumulative Impacts. Exotic invasive plant species can change the structure and function of native plant communities. These changes can have an adverse impact on habitat for native species that rely on the native plant communities. Soil and vegetation disturbances encourage growth of invasive species. An exotic plant management plan has been developed for Biscayne National Park and eight other national park system units in the region. Removal of nonnative species would provide better conditions to reestablish native vegetation in disturbed areas, which could help mitigate the adverse impacts associated with social trails in the park. Implementation of this management plan would have a long-term, beneficial impact on terrestrial vegetation in the park and the habitat it provides.

Because there would be no project-related contribution to the impacts of other past, present, and future actions, this alternative would not have any new contribution to cumulative impacts.

Conclusion. Under the no-action alternative, existing, negligible to minor, adverse impacts on terrestrial vegetation in the park would continue as a result of social trails and trampling, but there would be no additional

impacts caused by implementing this alternative. There would be no project-related cumulative impacts.

Wetlands

Mangrove wetlands are found along the mainland coast and the fringes of the keys in the park. Under this alternative, wetlands in the park would continue to serve as an important habitat area for a wide variety of terrestrial and aquatic species. Currently, access for visitors into the mangroves is limited. No new access into the mangroves would be developed under this alternative on the mainland or on the keys so there would be no change in the current size, integrity, or continuity of wetland areas in the park. Where wetlands have previously been impacted by development, including both park infrastructure for administration and visitor use as well as historic resources, those impacts would continue to persist and are generally long term, minor to moderate, and adverse.

As no new actions are proposed, there would be no new or additional impacts as a result of implementing the no-action alternative.

Cumulative Impacts. The Biscayne Bay Coastal Wetlands Project of the Comprehensive Everglades Restoration Plan includes pump stations, spreader swales, stormwater treatment areas, flow ways, levees, culverts, and backfilled canals in southeast Miami-Dade County and covers 13,600 acres from the Deering Estate south to Turkey Point Power Plant. The purpose of this project is to rehydrate wetlands and reduce point source discharge to Biscayne Bay. Phase I has been implemented. The project is beginning to replace lost overland flow and partially compensate for the reduction in groundwater seepage by redistributing (by using a spreader system) available surface water entering the area from regional canals. The redistribution of freshwater flow across a broad front is expected to restore or enhance freshwater wetlands, tidal wetlands, and near-shore bay habitat. Sustained lower-than-seawater salinities are required in tidal wetlands and the near-shore bay to provide nursery habitat for fish and shellfish. This project is expected to create conditions that would be conducive to the reestablishment of oysters and other components of the oyster reef community.

Diversion of canal discharges into coastal wetlands associated with Biscayne Bay Coastal Wetlands Project of the Comprehensive Everglades Restoration Plan is expected not only to reestablish productive nursery habitat along the shoreline, but also to reduce the abrupt freshwater discharges that are physiologically stressful to fish and benthic invertebrates in the bay near canal outlets. The impact of implementing these actions would be beneficial for wetlands inside and outside the park.

The actions proposed in the Biscayne Bay Coastal Wetlands Project could improve the overall health of wetland areas along the mainland shoreline such that the system as a whole is better able to accommodate the stresses associated with the short- and long-term impacts of the development and human use in the area.

These other past, present, and future actions, in conjunction with the ongoing management actions in the park, would result in beneficial impacts on wetlands in the park.

Because there would be no project-related contribution to the impacts of other past, present, and future actions, this alternative would not have any new contribution to cumulative impacts.

Conclusion. Pre-existing, long-term, minor to moderate, adverse impacts to wetlands would persist due to past land management actions. There would be no new or additional impacts on wetlands under this alternative. There would be no project-related cumulative impacts.

Submerged Aquatic Communities

Shallow benthic communities would continue to be vulnerable to impacts from boating. Boat activity has been associated with increased turbidity in shallow areas. In most areas of the bay, submerged aquatic communities would continue to be vulnerable to impacts from boating. Because the bay is shallow, boat activity has been associated with increased turbidity in all the aquatic communities. Damage to seagrass beds from boat groundings and anchors has degraded habitat for manatees, crustaceans, and echinoderms that inhabit these areas. Boat groundings (propeller and hull impacts) and inadvertent placement of anchors have damaged the dense soft corals, sea fans, and sponges in the hardbottom communities, which in turn have an adverse impact on the fish and invertebrates that seek refuge in these areas.

Coral reefs are complex ecosystems and sensitive to disturbances including fishing, snorkeling, and scuba diving. The damage caused by these activities includes scarring from boat propellers and inadvertent placement of anchors, as well as breakage caused by snorkeling and scuba diving.

Debris from recreational and commercial fishing (e.g., fishing tackle and lines from crab and lobster traps) left on the reef can wrap around the coral and damage it. Fishing also results in removal of predators and the removal of herbivorous fish that keep algae minimized (contributes to reef health). Damage to the coral reefs also adversely impacts other species that rely on the reefs for food and shelter.

Under this alternative, the current high levels of unrestricted boat use as well as other recreational activities would continue to cause long-term, minor to moderate, adverse impacts on the function and productivity of submerged aquatic communities in the park.

With implementation of the *Fishery Management Plan*, the park anticipates the current condition of submerged aquatic communities would improve and the adverse impact of fishing on habitat within the park would be reduced. The long-term impacts of the *Fishery Management Plan* (2014) on fishery resources in the park would be beneficial to park fish and fish habitats due to the phase-out of commercial fishing. The adverse impacts on fish habitat associated with current management of boating in the park would continue. Under this alternative, the beneficial impacts on fishery resources associated with the *Fishery Management Plan* (2014) would be limited to what the plan proposes.

The United States Coral Reef Task Force, created in 1998, was established to lead U.S. efforts to protect, restore, and promote the sustainable use of coral reef ecosystems. These efforts include but are not limited to reducing and mitigating coral reef degradation from pollution, overfishing, and other causes. Until any recommendations take effect, coral reefs would still be subject to recreational activities that are harmful to the ecosystem. These impacts would continue to be long term, adverse, and minor to moderate.

Biscayne National Park completed the *Final Coral Reef Restoration Plan and Environmental Impact Statement* in 2012, which provides a systematic approach to addressing injuries to coral reefs caused by vessel groundings within the park. The goal of the plan is to provide a systematic approach for creating a stable, self-sustaining reef environment that existed prior to coral damages, such that natural recovery processes can lead to a fully functioning coral reef community. Under this alternative, the beneficial impacts on coral reefs associated with the Coral Reef Restoration Plan would be limited to what the plan proposes.

As no new actions are proposed, there would be no new or additional impacts as a result of implementing the no-action alternative.

Cumulative Impacts. The expanded developed area according to city and county plans with its associated population increase is

expected to continue and would probably result in additional boating use and related impacts on submerged aquatic communities, a long-term adverse impact.

Because there would be no project-related contribution to the impacts of other past, present, and future actions, this alternative would not have any new contributions to cumulative impacts.

Conclusion. Under the no-action alternative, existing, minor to moderate, adverse impacts on submerged aquatic vegetation in the park would continue due to ongoing recreational uses including boating, fishing, marine debris, scuba diving, and snorkeling. There would be no new impacts caused by implementing this alternative. There would be no project-related cumulative impacts.

Soundscapes

Natural soundscapes have been degraded from activities on land and water portions of the park such as vehicle engines, boat traffic, agricultural or industrial activity, and occasional construction. Because most of the park is open water, noise from motorized boats is the most prevalent disruption to natural soundscapes. Frequent boat-related noise is a short-term, minor to moderate adverse impact on natural soundscapes.

The concentration of cars and visitors around the visitor center and parking lot also affects the natural soundscape at Convoy Point. NPS staff mowing the grass and blowing leaves with motorized equipment causes short-term, localized adverse impacts on soundscapes in this area. This noise is generally tolerated in the visitor services / park administration zone, so the related impacts would be short-term, negligible and adverse.

Natural soundscapes predominate in the distant portions of the park, away from popular boating routes. Increases in visitation on weekends and during special events add to the number of boats on the bay at one time. Impacts associated with an increased number of boats in the park would be short term, minor to moderate, and adverse.

As no new actions are proposed, there would be no new or additional impacts as a result of implementing the no-action alternative.

Cumulative Impacts. The expanded developed area according to city and county plans with its associated population increase is expected to continue and would likely result in increased boating on park waters and increased boat engine noise throughout the park.

Because there would be no project-related contribution to the impacts of other past, present, and future actions, this alternative would not have any new contribution to cumulative impacts.

Conclusion. Existing long-term, minor to moderate adverse impacts on natural soundscapes would continue as a result of persistent boat-related noise. Existing short-term, adverse impacts on natural soundscapes would continue as a result of routine park operations and maintenance activities as well as concentration of cars and visitors around Convoy Point.

Implementing alternative 1 would have no new impacts on natural soundscapes. Because this alternative would not have any new impacts on the natural soundscape, there would be no project-related cumulative impacts.

CULTURAL RESOURCES

Archeological Resources (including submerged archeological)

Under the no-action alternative, archeological (including submerged archeological) resources would continue to be surveyed, inventoried, and evaluated under NRHP criteria of evaluation to determine their

eligibility for listing in the national register. All ground-disturbing activities would be preceded by site-specific archeological surveys and, where appropriate, subsurface testing to determine the existence of archeological resources and how best to preserve them. Known archeological resources would be avoided whenever possible and only negligible to minor adverse impacts would be anticipated.

Although ongoing and expanded archeological site monitoring programs would be initiated and efforts would be undertaken to minimize or mitigate potential impacts from human activities and natural causes, an unknown number of archeological sites in Biscayne National Park would continue to be impacted by current and ongoing human activities. These ongoing activities would continue to cause long-term, localized, or permanent, minor adverse impacts. The ongoing survey and inventory efforts would result in long-term beneficial impacts.

Treasure hunting, looting, and amateur collecting, which have had an impact on the park's archeological resources over the years, would continue to be a threat to the park's submerged cultural resources. Although such activities are not permitted in the park, and restricting underwater access to visitors at Legare Anchorage (which only covers a portion of the Offshore Reefs Archeological District) would continue to provide some protection for some submerged cultural resources, the park is still affected by these activities. Continuance of these activities in the park and surrounding waters promotes the commercial value of artifact selling to tourists and makes it lucrative for artifact hunters to visit the park. Much of the local public condones such activity, although recognizing that it is illegal or requires permitting in other areas such as the Florida Keys National Marine Sanctuary and other state waters. Continued looting, depending on its severity, would be a minor adverse impact on submerged archeological resources.

Submerged cultural resources would also continue to be impacted by activities associated with commercial and sport fishing such as accidental net snagging. Recreational and commercial boating would continue to impact submerged archeological sites through the erosive processes of waves caused by their passage as well as activities such as dropping anchors. Impacts on cultural resources from fishing and boating would be long term to permanent, adverse, and of minor intensity depending on the frequency and intensity of these activities.

Although not as numerous or as threatened, Biscayne National Park's terrestrial archeological sites on the mainland and keys would continue to be subjected to similar concerns as those of the submerged sites. Most of the known terrestrial archeological sites, however, are not readily accessible to the public because of natural barriers and their isolation, and thus most human impacts on such resources would result from inadvertent or accidental use of park lands. Most of the significant prehistoric and historic sites on the islands are well protected by their distance from areas commonly used by the public and dense vegetation that makes them difficult to reach. Continued closure of Arsenicker and West Arsenicker Keys would help protect potential archeological resources on these islands. Because of their inaccessibility, any adverse impacts on terrestrial archeological resources would be negligible to minor and permanent.

As no new actions are proposed, there would be no new or additional impacts as a result of implementing the no-action alternative.

Cumulative Impacts. In the past, the relative isolation of the park and the lack of sufficient resource monitoring and protection programs have provided opportunities for treasure hunters, amateur collectors, and looters to engage in hunting artifacts and intentionally pilfering submerged archeological resources. Visitors have contributed to inadvertent disturbance of submerged and terrestrial archeological resources. Because much of the

park has not been surveyed and inventoried for archeological resources, decisions about site development, such as visitor facilities and permitted activities, such as recreational and commercial boating and commercial and sportfishing, have sometimes been made that in hindsight may have resulted in disturbance of archeological sites in the park. These impacts have been primarily permanent, negligible to minor and adverse.

Ongoing NPS activities, such as expanded archeological site monitoring programs and archeological survey and inventory efforts, would provide better understanding and protection of the park's submerged and terrestrial archeological resources—a beneficial impact. Other current or reasonably foreseeable planning endeavors to protect Biscayne Bay resources—such as the *Florida Keys National Marine Sanctuary Revised Management Plan* (2007), *Comprehensive Everglades Restoration Plan*, Southeast Florida Coral Reef Initiative, Biscayne Bay Partnership Initiative, and the *Biscayne Bay Strategic Access Plan*—could also potentially contribute to these beneficial impacts on the park's archeological resources.

As described above, implementation of the no-action alternative would result in permanent, negligible to minor, adverse impacts and some beneficial impacts. The impacts of the no-action alternative, in combination with both the negligible to minor, permanent adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a permanent, negligible to minor, adverse cumulative impact. The adverse impacts of the no-action alternative, however, would be a small component of the adverse cumulative impact.

Because there would be no project-related contribution to the impacts of other past, present, and future actions, this alternative would not have any new contribution to cumulative impacts.

Conclusion. Under this alternative, there would be primarily localized, negligible to minor, adverse, short-term to permanent impacts on submerged archeological resources, while impacts on terrestrial archeological resources would be in the negligible to minor range. Some benefits would result from survey and inventory of both submerged and terrestrial properties potentially eligible for national register listing. Generally, both submerged and terrestrial archeological resources would continue to be surveyed, inventoried, and evaluated, and all ground-disturbing activities would be preceded by site-specific archeological investigations to ensure that archeological resources would not be damaged or lost as a result of NPS actions.

Actions under this alternative would not contribute to any overall cumulative impact on terrestrial and submerged archeological resources. The adverse and beneficial impacts on archeological resources generally, however, would be a relatively small component of any overall cumulative impact.

Historic Structures and Buildings

Under the no-action alternative, historic structures and buildings in the park would continue to be surveyed, inventoried, and evaluated under NRHP criteria to determine their eligibility for listing in the national register as staff and funding permit. The surveys and research necessary to determine the eligibility of a structure or building for listing in the national register are a prerequisite for understanding the resource's significance, as well as the basis of informed decision making in the future regarding how the resource should be managed. Such surveys and research would have a long-term beneficial impact.

To appropriately preserve and protect national register-listed or -eligible historic buildings and structures, all stabilization, preservation, and rehabilitation efforts would be undertaken in accordance with *The*

Secretary of the Interior's Standards for the Treatment of Historic Properties (1995). Because the repair and replacement of historic fabric associated with the preservation or rehabilitation of historic buildings and structures would be undertaken in accordance with those standards, any adverse impacts would be long term and negligible to minor in intensity.

Historic structures and buildings, such as Fowey Rocks Lighthouse and those in the Boca Chita Key Historic District, could suffer natural deterioration and wear and tear from increased visitation and unstaffed or minimally staffed structures could be susceptible to vandalism. Regular cyclic maintenance and rehabilitation repairs minimize potential negligible to minor adverse impacts, and the possible monitoring of the user capacity of historic structures could result in the imposition of visitation levels or constraints that would contribute to the stability or integrity of the resources without unduly hindering interpretation for visitors, and continued ranger patrol and emphasis on visitor education would discourage vandalism or inadvertent impacts and minimize adverse impacts. Any adverse impacts would be long term and of negligible to minor intensity.

As no new actions are proposed, there would be no new or additional impacts as a result of implementing the no-action alternative.

Cumulative Impacts. In the past, the lack of appropriate preservation treatments and the loss of historic fabric resulting from visitor use and vandalism have resulted in long-term, minor, adverse impacts on the historic structures and buildings of the Boca Chita Key Historic District. Other recent, current, and reasonably foreseeable future planning endeavors or undertakings to preserve historic structures or buildings in the surrounding region could potentially contribute to some beneficial impacts on historic structures and buildings.

As described above, implementation of the no-action alternative would result in long-term, negligible to minor, adverse impacts and beneficial impacts on historic structures and buildings. The impacts of the no-action alternative, in combination with the minor, long-term, adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term, negligible to minor, adverse cumulative impact. The adverse impacts of the no-action alternative, however, would be a small component of the adverse cumulative impact.

Because there would be no project-related contribution to the impacts of other past, present, and future actions, this alternative would not have any new contribution to cumulative impacts.

Conclusion. Actions under alternative 1 would generally have long-term, localized, beneficial and long-term, negligible to minor adverse impacts on historic structures and buildings. Actions under this alternative would attempt to minimize the continued loss of historic fabric to historic structures and buildings in the Boca Chita Key Historic District and Fowey Rocks Lighthouse through law enforcement efforts and cyclic maintenance and preservation treatment. Implementation of this alternative would have long-term, beneficial impacts on the historic structures in the park because they would be preserved in accordance with the Secretary's Standards.

Actions under this alternative would generally contribute to beneficial impacts and the negligible to minor adverse impacts related to any overall cumulative impact on historic structures and buildings. Overall, the cumulative impact would be negligible to minor and adverse. The adverse and beneficial impacts on historic structures and buildings, however, would be a relatively small component of any overall cumulative impact.

Cultural Landscapes

Under the no-action alternative, the cultural landscape at the Boca Chita Key Historic District and Jones Family Historic District would continue to be managed in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*. Potential cultural landscapes in Biscayne National Park would continue to be surveyed, inventoried, and evaluated under NRHP criteria to determine their eligibility for listing in the national register as NPS staff and funding permit. Ongoing studies would continue inventory and evaluation of the following potential cultural landscapes in the park:

- Sweeting Homestead – Elliott Key
- Maritime Cultural Landscape – parkwide

Pending results of these evaluations, the National Park Service would recommend listing the park's significant cultural landscapes in the national register. The National Park Service would implement resource management policies that preserve the natural resource values of the listed, or determined eligible, landscapes as well as their culturally significant character-defining patterns and features in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*. The surveys, inventories, and evaluation of cultural landscapes and their character-defining patterns and features are the basis of informed decision making in the future regarding how national register-eligible or -listed resources should be managed, which would be a beneficial impact.

Continued and increasing use of Boca Chita Key as a visitor destination point could continue to have some negligible to minor, adverse, short-term to long-term impacts on the integrity of the historic district's cultural landscape, and continued use of Elliott Key for docking, picnicking, hiking, and camping could continue to have some short-term to long-term, negligible to minor, adverse impacts on the integrity of the potential cultural landscape associated with Sweeting Homestead. The relatively remote and inaccessible location of Porgy and Totten Keys would afford protection to the cultural landscape associated with the Jones Family Historic District. The continued management of Porgy Key and Totten Key in their isolation would have a beneficial impact.

As no new actions are proposed, there would be no new or additional impacts as a result of implementing the no-action alternative.

Cumulative Impacts. In the past, lack of awareness for the preservation of potential cultural landscapes in the park has resulted in decisions about site development and resource management that, in hindsight, may have not have been best for the preservation of cultural landscape values and preservation. Such decisions include the placement and location of a restroom building, wooden boardwalk, and concrete paths that have compromised some of the character-defining patterns and features of the Boca Chita Key cultural landscape by adding prominent, nonhistoric structures and features to the landscape and covering or damaging historic walking paths. These past impacts could be a long-term, minor, adverse impact.

Other recent, current, and reasonably foreseeable future planning efforts to protect Biscayne Bay resources—such as the *Florida Keys National Marine Sanctuary Revised Management Plan* (2007) (comprehensive protection of diverse marine environments of the keys), and *Comprehensive Everglades Restoration Plan* (restoration and preservation of the Everglades and the South Florida ecosystem)—could potentially contribute to the preservation of character-defining patterns and features of cultural landscapes. Impacts on cultural landscapes associated with such preservation efforts would be beneficial.

As described above, implementation of the no-action alternative would result in long-term, negligible to minor, adverse impacts and beneficial impacts on cultural landscapes. The impacts of the no-action alternative, in combination with the minor, long-term, adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term, minor, adverse cumulative impact. The adverse impacts of the no-action alternative, however, would be a small component of the adverse cumulative impact.

Because there would be no project-related contribution to the impacts of other past, present, and future actions, this alternative would not have any new contribution to cumulative impacts.

Conclusion. Actions under alternative 1 would have beneficial impacts on the landscape at the Boca Chita Key Historic District and Jones Family Historic District, as well as other potential cultural landscapes because park properties would continue to be surveyed, inventoried, and evaluated under national register criteria of evaluation to determine their eligibility for listing in the national register. Listed and eligible cultural landscapes would be managed to preserve their natural resource values and culturally significant character-defining patterns and features in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*. Some unidentified cultural landscapes might experience long-term, minor, adverse impacts. Under alternative 1, potential cultural landscapes would experience mostly beneficial, short-term to long-term impacts. Actions under this alternative would generally contribute to long-term, cumulative beneficial impacts on cultural landscapes.

VISITOR EXPERIENCE

Diversity of Visitor Activities

Visitors with boats would continue to have unrestricted access to most (approximately 97%) of park waters. Visitors would be able to participate in a full range of activities such as motorboating, sailing, paddling, swimming, scuba diving, snorkeling, fishing, and nature study.

Under current park management policy, resource conditions fail to offer visitors the type of experiences for which the park was established. Under the no-action alternative, resource conditions and visitor experience would continue to degrade.

Some operators who lack information and/or navigation skills would continue to have the negative experience of running aground in shallow areas, potentially damaging their equipment and park resources and incurring fines and towing fees. In addition, the wide range of mixed use would continue to result in visitor conflicts in some locations such as safety conflicts between swimmers and motorboaters and speed and noise conflicts between motorboaters and nonmotorized boaters.

As visitor numbers increase over time, more areas of the park, especially during peak use times, would experience more conflicts and increased frequency of motorboaters running aground. For some visitors who enjoy a more social experience and the ability to travel and recreate throughout the park, increased numbers of visitors would not necessarily be perceived as a problem. However, it is likely that as incidents of conflict and groundings increase, many power boaters would perceive the change in their experience over time to be a long-term, minor to moderate, adverse impact on the quality and safety of their visit.

Visitors with boats who are seeking solitude and the natural sights and sounds of the park's bay and ocean waters would find it increasingly difficult to experience these

qualities as visitor numbers increase. Also, safety would be an increasing problem because of the limited speeds and maneuverability of nonmotorized boats. This change in conditions would probably be perceived over time as a long-term, minor, adverse impact on these visitors' ability to navigate safely in park waters and achieve opportunities for quiet, solitude, and nature study.

There are areas of the park where visitors would continue to have limitations on their activities. This includes the slow speed zone along the mainland and at Sands Cut (by Sands Key), which would continue to restrict visitor use of about 2,059 acres of park waters. These limitations would continue to enhance visitor safety along the often crowded Sands Cut area and manatee protection area near the mainland, adding value to visitor opportunities to see these rare animals. Arsenicker Key, West Arsenicker Key, and adjacent waters within 200 feet from shore would continue to be closed to visitors for resource protection. Also, visitors would continue to be prohibited from stopping at Legare Anchorage or leaving their boat to swim or dive. These restrictions at Legare Anchorage (in its current configuration) would continue on about 2,014 acres of park waters. Because all these restrictions are well established, their continuation would have long-term, negligible, adverse impacts on visitor experience.

As no new actions are proposed, there would be no new or additional impacts as a result of implementing the no-action alternative.

Visitor Services and Facilities

Visitors would continue to have access to most of the park's land areas and would be able to participate in a range of land-based recreation such as hiking, picnicking, shore fishing, camping, nature study, and visiting historic sites. The level of access would generally continue to be limited by (1) the natural limitations of mangrove and tropical hardwood hammock habitats, and (2) the existing limits of facility development such as docking capacity and trail development. In this alternative, these conditions would continue relatively unchanged. As a result, visitor numbers on the keys would continue to be low to moderate. However, as visitor levels in the park increase, there would be an increasing likelihood that docking facilities at the keys would reach capacity more frequently and that some visitors who want access to the keys would not have anywhere to dock. This would potentially be a long-term, minor to moderate, adverse impact on some visitors' opportunities to access and experience these coral keys, especially during peak use periods.

Visitors who arrive at Convoy Point by car would continue to have easy access to visitor information and interpretation services at the Dante Fascell Visitor Center. Visitor center-based programs would continue to provide opportunities to learn about the significance and value of the park, which are not available elsewhere. This would continue to be a beneficial impact on visitor understanding and appreciation of South Florida's coastal marine environment. Visitors would use the services of the park concessioner at Convoy Point to rent paddlecraft, or scuba equipment, or pay for a glass-bottom boat tour or guided scuba and snorkeling trips. The concessioner would continue to provide occasional transport service to Elliott Key and Boca Chita Key for visitors interested in hiking, camping, and guided tours. Visitors who do not have the time, resources, or ability to use concessioner services would continue to be able to recreate in the Convoy Point area, including picnicking, fishing, and walking along the boardwalk. However, for many visitors, access to park waters and the keys beyond Convoy Point would remain limited, which would continue to be a long-term, minor to moderate, adverse impact on the quality of some visitor experiences.

As no new actions are proposed, there would be no new or additional impacts as a result of implementing the no-action alternative.

Cumulative Impacts. The expanded developed area according to city and county plans with its associated population increase is expected to continue and is being recognized by local, regional, state, and federal entities as important concerns affecting the region's environmental, economic, and community values. To this end, there are a number of ongoing studies and partnership efforts underway in the Biscayne Bay area to improve and protect water quality and quantity, wetlands, fishery resources, and coastal viewsheds. Projects include the *Fishery Management Plan* for Biscayne National Park; the *South Miami-Dade Watershed Study and Plan*; the *Biscayne Bay Surface Water Improvement and Management Plan*; the *Lower East Coast Regional Water Supply Plan Update* (2013); the Biscayne Bay Partnership Initiative; the Southeast Florida Coral Reef Initiative; and the *Biscayne Bay Coastal Wetlands Plan*. The projects could all contribute to improvements in visitor experience, especially related to quality fishing opportunities and other resource-based recreational activities. The intensity and duration of the cumulative impact of the above planning efforts would depend on the actual number and type of actions taken to implement them.

Adjacent state parks (such as Bill Baggs Cape Florida State Park, Key Largo Hammock Botanical State Park, and John Pennekamp Coral Reef State Park) and the Florida Keys National Marine Sanctuary offer services, facilities, and recreational opportunities that enable visitors to experience and learn about the natural and cultural resources of the Biscayne Bay and reef area. Also, current efforts through the Stiltsville plan and the public access plan for Biscayne Bay ("Get Your Feet Wet") provide opportunities for enhanced visitor access, education, and recreation related to the Biscayne Bay area. These nearby and available recreational and interpretive resources would result in a beneficial impact on visitor understanding and opportunities in the Biscayne Bay area.

Because there would be no project-related contribution to the impacts of other past, present, and future actions, this alternative 1 would not have any new contribution to cumulative impacts.

Conclusion. Continued speed limitations and closures under this alternative would have long-term, negligible, adverse impacts on current visitor use patterns or opportunities. The potential for increased crowding and conflict, especially during peak use times and between different user groups, would probably continue, which would continue to result in short-term, minor to moderate, adverse impacts on visitor experience. Lack of visitor services and facilities to support access to park waters and keys would continue to result in long-term, minor to moderate, adverse impacts to visitors. There would be beneficial cumulative impacts. Alternative 1 would have a slight contribution to these cumulative impacts.

NPS OPERATIONS AND FACILITIES

Actions under alternative 1 would provide continuation of current visitor opportunities, resource management practices, and law enforcement activities with current levels of personnel, facilities, and equipment. The park's developed area, which covers approximately 38 acres, would continue to be used for park operations and to provide recreational opportunities and visitor services. Mainland visitor services and infrastructure, including a visitor center, designated paths and trails, a boardwalk, and jetty, would remain at or near current levels at Convoy Point. Facilities on the keys would also continue to remain at or near current levels as follows:

- Boca Chita Key – boat dock, harbor, historic structures, picnic areas, restrooms, and primitive campground
- Elliott Key – boat dock, trail, picnic and restroom facilities, environmental education center, ranger station,

employee residences, and maintenance facilities

- Adams Key – boat dock, trail, picnic and restroom facilities, and employee residences
- visitor contact points outside the park – limited contact information and signs at public sites

Channels, harbors, and areas with limitations, such as the slow speed zone (2,059 acres) and Legare Anchorage (2,360 acres), in the park would continue to be marked by existing navigation aids and buoys.

Because of the expanded developed area according to city and county plans with its associated population increase, the park's staff has estimated that the number of current employees would need to be increased by 25% to stay current with the needs of law enforcement, visitor protection, resource management, facility maintenance, interpretation, and adequate contacts with visitors. However, no staffing increase is currently approved.

Additionally, to provide effective visitor protection and resource management, the park needs updated communications equipment and additional vessels, but such needs would continue to be largely unmet. Special events, such as the Columbus Day Weekend, would probably continue to grow in size, thus resulting in increasing strains on the park's overburdened staff. Visitor destination points, such as day use areas and campgrounds, would continue to be frequently congested and overcrowded during peak visitation periods, challenging the ability of NPS staff and existing facilities to provide an acceptable level of desired services. Increased visitor impacts combined with static or reduced staffing capacity would continue to adversely impact park operations. Thus, this alternative would have long-term, moderate, adverse impacts on park operations and facilities.

As no new actions are proposed, there would be no new or additional impacts as a result of implementing the no-action alternative.

Cumulative Impacts. Past and ongoing cooperative planning and development projects in the Biscayne Bay region, such as the Biscayne Bay Partnership Initiative, *Miami-Dade County Comprehensive Development Master Plan*, and *Biscayne Bay Strategic Access Plan*, and NPS special resource studies, such as those for Miami Circle and Virginia Key Beach Park, have resulted in some long-term beneficial impacts on park operations and facilities. National Park Service participation in such collaborative efforts has enabled the National Park Service to engage in constructive dialogue with park neighbors regarding park operations and facilities. Such efforts have provided the National Park Service with better information on Biscayne Bay-wide visitor trends, services, and facilities, thus enabling NPS managers to make more informed decisions regarding appropriate park operations and facilities as well as enhancing the park's ability to provide desired services. However, these beneficial impacts are almost impossible to measure.

This alternative's long-term, moderate, adverse impacts, in combination with the aforementioned beneficial impacts of past and ongoing cooperative planning and development projects in the Biscayne Bay region, would result in long-term adverse cumulative impacts. However, this alternative's contribution to these impacts would be small.

Because there would be no project-related contribution to the impacts of other past, present, and future actions, this alternative would not have any new contribution to cumulative impacts.

Conclusion. Overall, actions under alternative 1 would result in continuing long-term, moderate, adverse impacts on park operations and facilities due to unmet operational needs. The overall cumulative

impacts would be long term and adverse; this alternative's contribution to these impacts would be small and adverse.

SOCIOECONOMIC ENVIRONMENT

The social and economic situation in Miami-Dade County is affected by a combination of many factors, including the present national park system units. Some of the $15.5 billion in federal spending in the county is generated by Biscayne National Park in the forms of employee wages, purchase of supplies, and various contracts. The no-action alternative would not result in any change to current contributions that park operations and visitation have on the regional economy. Visitors would continue to visit the park in the same manner, experience, and social conditions. Although tourism is not the most important driving factor in the regional economy, the livelihoods of service-related businesses in the region rely to some degree on the inflow of tourist dollars, especially restaurants and hospitality sectors. Contributions to the local and regional economies that result from park visitation would continue to be long term and beneficial.

The coastal environments and the resources and activities they support including seafood, carbon sequestration, recreation activities, and tourism among others have been estimated to contribute about $595 billion annually to the U.S. gross domestic product (NOAA 1999). It has been estimated that Biscayne Bay-related recreational activities created $3.8 billion in economic output, $2.1 billion in incomes, and 57,000 jobs (Hazen and Sawyer 2005). However, there are indications that Biscayne Bay is showing a decreased capacity, or resilience, to withstand external pressures that may affect the bay's long-term health, and its environmental and economic sustainability (Adams and Blair 2014). The continuation of current management of boating and park fishery resources, combined with the expanded developed area according to city and county plan with its associated population increase, would continue to have adverse impacts on submerged aquatic communities including park fishery resources—a potential long-term, minor adverse impact on tourism and associated service-related businesses that depend on the health of these resources.

The wide range of mixed use would continue to result in visitor conflicts in some locations and it is likely to increase as visitation increases, which may lead visitor park experience being perceived as less safe and of diminishing quality—a potential long-term, adverse impact on visitation levels. Economic studies beginning with Fisher and Krutilla (1972); Cichetti and Smith (1973, 1976); Prince and Ahmed (1988) have shown that congestion will cause recreationists to adjust their length of visit and satisfaction with their recreation experiences. In 2014, the Greater Miami Convention and Visitors Bureau survey reported that favorable impressions of Miami have declined among domestic and international visitors alike, which was attributed to visitors' dissatisfaction with traffic, a form of overcrowding (GMCVB 2014). Furthermore, GMCVB reports that international visitors' (which represent the driving force of visitor growth to Miami) intent to return declined in 2013.

Under this alternative, visitors would continue to have access to most of the park's land areas. The level of access to park waters would generally continue to be limited based on private access to a boat, availability of NPS concessions/external guides, and docking and trail capacity at the keys. Visitor services and facilities currently offered would continue relatively unchanged.

The total direct economic value of public recreation areas also includes two sets of values: (1) the user benefit that people receive from their visit, and (2) land values near the recreation area. Economic studies have shown that the value of land can increase with the number of outdoor recreation opportunities and the proximity to outdoor recreation space (Clawson and Knetsch 1966). Therefore, the

continued presence and operation of Biscayne National Park will continue to provide a long-term, beneficial impact on the residents and property values in the vicinity.

As no new actions are proposed, there would be no new or additional impacts as a result of implementing the no-action alternative.

Cumulative Impacts. Due to the concerns about ongoing and anticipated impacts to the natural environment throughout the region, a number of partnership and planning efforts have been established to improve and protect Biscayne Bay resources that support recreation, fishing, wetlands restoration, and shoreline protection among other goods and services. Projects include a multibillion dollar restoration project—the *Comprehensive Everglades Restoration Plan*; the *South Miami-Dade Watershed Study and Plan*; the *Biscayne Bay Surface Water Improvement and Management Plan*; the *Lower East Coast Regional Water Supply Plan*; the Biscayne Bay Partnership Initiative; the Southeast Florida Coral Reef Initiative; and the *Biscayne Bay Coastal Wetlands Plan*. All these projects have the potential to contribute to the restoration and sustainability of the natural environment, especially related to quality fishing opportunities and other resource-based recreational activities. No specific actions to achieve these goals have been proposed in this alternative. The intensity and duration of the cumulative impact of the above planning efforts would depend on the actual number and type of actions taken to implement them.

The park's *Fishery Management Plan*, described previously, proposes changes to the management of commercial fishing parkwide. Changes proposed under the *Fishery Management Plan* final preferred alternative aim to increase the abundance and average size of targeted fish and invertebrate species within the park by at least 20% over current conditions and over conditions in similar habitat outside the park. With implementation of the *Fishery Management Plan*, the park anticipates the current condition of fishery resources would improve and the adverse impact of fishing on habitat within the park would be reduced. The impacts of the park's *Fishery Management Plan*, coupled with the above-mentioned partnership and planning efforts, are expected to result in long-term beneficial impacts on park fishery resources and the economic activities supported by healthy fishery resources including tourism, recreational fishing, and commercial boating. Under this alternative, the beneficial impacts on park fishery resources associated with the *Fishery Management Plan* would be limited to what that plan proposes. For detailed information on the impacts of the *Fishery Management Plan* proposed changes please visit http://www.nps.gov/bisc/parkmgmt/fishery-management-plan.htm.

Adjacent state parks as well as nearby nationally protected areas offer facilities and recreational opportunities that support the region's tourism industry. Also, current efforts through the Stiltsville plan and the public access plan for Biscayne Bay ("Get Your Feet Wet") provide opportunities for enhanced visitor access, education, and recreation related to the Biscayne Bay area. These nearby and available recreational opportunities would result in a beneficial impact on tourism and visitor-related businesses. As visitor levels increase, there would be an increased likelihood that current park visitor services and facilities at the keys would be inadequate to support the regional efforts in enhancing tourism and increasing visitor access and recreational opportunities in the area.

As there are no project-related contributions to the impacts of other past, present, and future actions, there would be no new or additional impacts as a result of implementing the no-action alternative.

Conclusion. Existing contributions to the local and regional economies would continue to be long-term and beneficial. The potential for increased crowding, conflict and declined park submerged aquatic resources health would probably continue—a potential long-term, minor adverse impact on tourism and associated service-related businesses that

depend on the health of Biscayne Bay marine resources and positive visitor experiences. As visitor levels increase, there would be an increased likelihood that current park visitor services and facilities at the keys would be inadequate to support the regional efforts in enhancing tourism and increasing visitor access and recreational opportunities in the area. Implementing the no-action alternative would have no new impact on the regional economy. There would be no project-related cumulative impacts.

UNAVOIDABLE ADVERSE IMPACTS

Existing moderate or major adverse impacts to fishery resources, federally listed sea turtles, smalltooth sawfish, and stony corals, submerged aquatic communities, and natural soundscapes would be expected to continue. These impacts are primarily caused by the relatively unrestricted use of motorized boats as well as fishing and marine debris that continue to impact most park waters and submerged habitats. These impacts cannot be fully mitigated by perpetuating existing park operations and thus are unavoidable under the no-action alternative.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

There would be no change in irreversible or irretrievable commitments of resources as a result of implementing the no-action alternative because there would be no new development occurring in previously undeveloped areas.

NATURAL OR DEPLETABLE RESOURCES AND ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

No change in resource consumption, energy requirements, or conservation potential is expected as a result of implementing the no-action alternative.

IMPACTS OF IMPLEMENTING ALTERNATIVE 2

NATURAL RESOURCES

Fishery Resources

Under this alternative, there would be additional management actions designed to protect fish habitat in the park by reducing the potential negative impacts of boating on seagrass beds such as scarring and localized turbidity. The 1,000 foot slow speed area along the mainland shore would be modified so that the 500 feet nearest the shore would be designated as a noncombustion engine use zone and the remaining 500 feet would be designated as a slow speed zone. West, Middle, and East Featherbed Banks, and the waters on the northwest side of Elliott Key would be designated as slow speed zones (see alternative 2 map). A noncombustion engine use zone (poling and trolling only) would be established in the waters surrounding Totten and Rubicon Keys, Jones Lagoon, and the Cutter Bank Shallows. Both the slow speed and noncombustion engine use zones would reduce boat traffic overall in these waters as well as reduce the impacts associated with high-speed boat traffic in shallow water such as seagrass scarring and localized turbidity. These actions would result in long-term beneficial impacts.

There would be an increase in the number of people fishing from the shoreline if a new boardwalk was built facing the bay waters. This would be expected to have a long-term, negligible, adverse impact on park fishery resources. Species in both the bay and the reefs would continue to experience substantial pressures from both commercial and recreational fishing. Some species would continue to be subject to overfishing. These impacts would continue to be adverse and minor to moderate in the long term.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would generally be the same as those described under alternative 1. Alternative 2 would contribute a beneficial impact and continuation of a minor adverse increment to the beneficial and adverse impacts of other past, present, and future actions resulting in beneficial cumulative impacts. The magnitude of this contribution to this alternative would be slight.

Conclusion. Adverse impacts now occurring on fishery resources and habitat in the park would be reduced under this alternative due to the additions of slow speed and noncombustion engine use zones, resulting in a long-term beneficial impact in some locations and continuation of a minor to moderate adverse impact in most of the park waters. There would be no new adverse impacts from proposed management actions. Cumulative impacts would be beneficial. The magnitude of the contribution of this alternative would be slight.

This alternative would provide a greater benefit to park fishery resources habitat in the seagrass than alternative 1, but these actions do not apply to all habitat areas and do not address adverse impacts on the coral reefs which serve as important fish habitat. The long-term adverse impacts on fish habitat throughout the park would be less than the no-action alternative but would still continue at a reduced level.

Threatened and Endangered Species

Manatee. If the proposed boardwalk at Convoy Point is constructed so that it would have a shading impact on seagrass, it would result in long-term negligible adverse impacts to manatee habitat. Manatees are more likely to be found in the warm waters nearest shore, so as in alternative 1 there would continue to be a manatee protection area in the waters

nearest the shoreline. The manatee protection area would be modified so that the 500 feet nearest the shoreline would be designated a noncombustion engine use zone and the remaining 500 feet would be designated a slow speed zone. Within the noncombustion engine use zone, management would focus on protecting water-based resources and minimizing visitor use impacts. This zone would provide additional protection to the manatee by reducing the potential for boat-related injuries and mortality in the areas where manatees are most likely to occur. The slow speed zone and noncombustion engine use zone would result in fewer boat groundings in seagrass and would reduce collisions with manatees. The modifications to the manatee protection area would have a long-term beneficial impact for manatees in the park.

Section 7 Determination of Effect— Measurable beneficial outcomes on manatees and manatee habitat because of the protective zones are likely. The determination of effect is "may affect, not likely to adversely affect" for manatee under alternative 2.

Sea Turtles. In the waters of the multiuse zone (water), impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include potential for collisions with boats, strangulation and entanglement with marine debris (including lobster and crab traps), hook-and-line fishing, and vessel groundings on sea turtle foraging habitat (coral and seagrass), which may adversely affect sea turtles, particularly loggerhead, hawksbill, and green species. Leatherback and Kemp's Ridley would be less likely to be affected because they are rarely in the park. These impacts would continue to be long term, minor to moderate, and adverse.

Collisions between boats and sea turtles would be expected to be minimized in the slow speed and the noncombustion engine use zones.

Studies in Florida and other areas in the world have shown that artificial light adversely impacts sea turtle nesting. Light on Elliott Key is primarily generated from park service facilities, campground, and visitor harbor, all on the bay side of the island. This light does not reach the nesting beaches, which are on the ocean side of the island. Any light generated by campers in the group campsite on the ocean side of Elliott Key would be minimal and unlikely to reach sea turtle nesting beaches. The improvement of existing trails and establishment of new primitive trails that would connect the new primitive campsites on Elliott Key could increase the number of visitors that venture to the beaches where the turtles tend to nest. This could require that the park change the management of this area to minimize disturbances to the turtles. Additional mitigation measures could also include increased visitor education and increased monitoring throughout the park and particularly in areas near where turtles nest. With mitigation, the impacts would be long-term and adverse but negligible.

Section 7 Determination of Effect— Impacts to sea turtles from fishing and boating would persist in most of the park, resulting in a determination of "may affect, likely to adversely affect" for loggerhead, hawksbill, and green species that frequent the park waters.

American Crocodiles. Most visitor services and infrastructure in habitat suitable for crocodile would remain near current levels with the designated paths, with the exception of a viewing platform, boardwalk jetty in the vicinity of Convoy Point. This area is north of the designated critical habitat area for the crocodiles and so would not be expected to impact crocodile activities in the park. The mangrove south of the visitor center would continue to be managed primarily to protect the natural habitat characteristics of the area. No additional development within the designated critical habitat would be proposed under this alternative. The impacts of activities on crocodile habitat and activities

along the mainland shore would be long term, negligible and adverse.

The designated critical habitat includes the eastern shorelines of the keys southwest of the tip of Elliott Key to the park boundary. The critical habitat includes Porgy Key, which would be zoned to provide visitor services as well as a base for some park administration activities. There are limited areas with suitable habitat on Porgy Key for crocodiles, so the impacts of any proposed development, such as the paddlecraft dock, would be minimal and localized. Visitation in this area would be expected to remain at current levels or increase because of the improved facilities and array of activities available on the key. These activities could include paddlecraft rental, which would allow visitors a nearby access point to the water zoned for noncombustion engine use around Old Rhodes and Totten Keys. There are dense mangrove areas along the eastern shores of both keys. Currently, the impact of increased visitation in this area on either habitat or individuals would be low. Although this area is within the designated critical habitat, few crocodiles have been seen in this area so impacts are expected to be adverse but negligible to minor.

If the population of crocodiles were to increase within the park, there could be increased interaction between humans and crocodiles. The developed area at Adams Key provides an excellent opportunity to orient visitors to designated critical habitat for crocodiles, including appropriate actions when traveling in crocodile habitat. With mitigation, the long-term adverse impact of this alternative on the crocodile population in this area of the park would be negligible.

As a whole, the park protects habitat for the crocodile and serves to further its conservation through education and law enforcement, resulting in long-term beneficial impacts to this species.

Section 7 Determination of Effect— The long-term impacts on the American crocodile under alternative 2 would be both beneficial due to habitat protection and education as well as negligible and adverse in localized areas. Mitigation measures would be put in place in the event of more human-crocodile interactions. Overall, this would equate to a "may affect, not likely to adversely affect" determination for the American crocodile.

Smalltooth Sawfish. In the waters of the multiuse zone (water), impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include potential for bycatch, which could occur with any continuation of hook-and-line fishing efforts as well as potential for entanglement in marine debris such as fishing line and nets. These impacts would continue to be adverse, minor to moderate, and long term, although realizing such effects are unlikely given the rarity of smalltooth sawfish in the park.

Construction of a boardwalk and platform in the mangroves in the Convoy Point area would affect a small amount of potential shallow water habitat. As in other alternatives, smalltooth sawfish could be affected by any increase in hook-and-line fishing efforts, although any effects are unlikely given the rarity of smalltooth sawfish in Biscayne National Park.

Section 7 Determination of Effect— Existing impacts from fishing would persist in much of the park and may be locally reduced in some shallow water locations zoned for sensitive resources, noncombustion engine use, and slow speed. The section 7 effect determination would be "may affect, likely to adversely affect" for smalltooth sawfish under alternative 6.

Schaus Swallowtail Butterfly and Miami Blue Butterfly. New and expanded development on Adams Key where butterfly habitat exists would include a new staging area for paddlecraft, a dock, primitive campgrounds, improved trails, and possibly a general store. The majority of this development would likely be near shore where habitat is less suitable for butterflies so would have a limited impact on butterfly

habitat. Development away from the water could be designed and located to minimize impacts on butterfly habitat. The impacts would be long term, negligible, and adverse.

Although visitation to most of Elliott Key is currently low, it is likely that visitation would increase once the additional facilities are developed—including hardening the trail that runs the length of the island and three new primitive trails and campsites near Petrel Point. However, there is typically little interaction between visitors and these butterflies. During installation of the trail and campsites, the area would be checked by a qualified biologist to ensure that no individual, host, or nectar plants would be disturbed. Under this alternative and with any necessary mitigation, the impact on the Miami blue butterfly population in the park would be long term, negligible, and adverse.

These impacts associated with park developments could be mitigated by timing trail work so that it does not coincide with butterfly breeding season, minimizing the number of trees that need to be removed during the hardening process, and minimizing changes in the drainage pattern on the island once the trail is completed. With these mitigation measures, the impacts would be long term, negligible, and adverse.

Management of Old Rhodes, Totten, and Swan Keys would be zoned to preserve natural resources with limited visitation, similar to the management currently in place under alternative 1. This would continue to have a beneficial impact on the butterfly populations on these keys. The greatest threat to the butterfly populations and habitat would remain weather-related phenomena.

Continued protection of butterfly habitat on these keys would generally be a beneficial impact to these butterfly species.

Section 7 Determination of Effect— The impacts on the Schaus swallowtail butterfly and the Miami blue butterfly would be both beneficial and long term, negligible and adverse in some locations, but mitigation measures to protect the species' habitat and breeding season are likely to be successful. Overall, the determination of effect for alternative 6 is "may affect, not likely to adversely affect" the Schaus swallowtail butterfly and Miami blue butterfly.

Stony Corals. In the waters of the multiuse zone (water) impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include the potential for ecological and physical stress to corals from overfishing, fishing debris, anchoring, and/or vessel groundings associated with existing boating and fishing activities. Such impacts are moderate, long-term adverse impacts to stony corals and their habitat.

Legare Anchorage would be reduced in size, and in-water activities would continue to be restricted for in-water activities that would provide protection to corals in this area.

It is anticipated that commercial fishing would eventually be phased out parkwide as provided for in the *Fishery Management Plan* (2014). This locally reduced fishing pressure, where targeted fish species could grow larger and therefore increase in reproductive output, would result in a long-term very beneficial impact on the stony coral habitat.

The use and maintenance of navigational markers and mooring buoys would continue to be used to minimize impacts to stony corals from unintentional vessel and anchor damage. The addition or relocation of mooring buoys and boundary markers would result in short-term, minor adverse impacts in specific areas associated with underwater installations and associated impacts to submerged substrates, although mooring buoys and boundary markers would be placed in locations away from corals, seagrass beds, and submerged cultural resources. Increased public outreach and/or law enforcement efforts would probably reduce the potential for illegal anchoring that could impact submerged

aquatic communities and thus is a beneficial impact.

There would be no new project-related impacts to stony corals.

Section 7 Determination of Effect— Existing boating, fishing, and marine debris impacts would persist in much of the park waters. Thus, this alternative would result in a determination of "may affect, likely to adversely affect" on stony corals.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. Alternative 2 would result in negligible adverse and beneficial impacts on federally listed species. When combined with the impacts of other past, present, and future actions, the overall cumulative effect would be beneficial. Alternative 2's contribution to these cumulative impacts would be slight.

Conclusion. Existing impacts to listed species and their habitat would persist in much of the park. Some impacts would be reduced through changes in zoning which would be expected to have localized beneficial impacts. Under this alternative there would be proposed minor development (paddlecraft dock on Porgy Key, trail hardening on Elliott Key) that could have negligible adverse impacts to manatees, American crocodiles, sea turtles, Schaus swallowtail butterflies, and Miami blue butterflies. This alternative would also have a long-term, beneficial impact on manatees due to slow speed and noncombustion engine use zones. The park would continue to coordinate with the U.S. Fish and Wildlife Service and NOAA Fisheries and work to mitigate any adverse impacts on these species. Thus, the section 7 determination would be that this alternative "may affect, not likely to adversely affect" for those species. However, existing impacts to sea turtles, stony corals, and smalltooth sawfish would continue to be long term, moderate and adverse and would result in a "may affect, likely to adversely affect" determination although there are no new impacts to these species associated with any proposed actions.

Special Status Species, Including State Listed Species

Birds. Arsenicker and West Arsenicker Keys host wading bird colonies including state listed wading birds and state listed white-crowned pigeons; West Arsenicker also hosts nesting bald eagles. These keys would be zoned a sensitive resource area and would remain closed. Thus, there would be no effect on the state listed wading birds, state listed white-crowned pigeons, bald eagles, or nesting activities for these species under this alternative. Furthermore, extending the sensitive resource zone 500 feet into the waters surrounding these islands would further reduce the likelihood of disturbances to bald eagles or state listed white-crowned pigeons or state listed wading birds on these islands.

Under this alternative, Soldier Key and the islands in Jones Lagoon would be zoned as nature observation zones. The waters of Jones Lagoon would be designated a noncombustion engine use zone. Visitation to Soldier Key and the islands of Jones Lagoon would be allowed, so there would be some human-caused intrusions to birds nesting, roosting, loafing, and/or foraging there. Actions under alternative 2 would reduce, although not eliminate, the potential for disturbance to birds using the Jones Lagoon area because there is still the possibility that small nonmotorized vessels (e.g., paddlecraft) and people coming ashore could closely approach the birds. These disturbances could result in disruptions to natural nesting, roosting, loafing, or foraging behaviors of state listed birds. The establishment of a visitor services zone on Porgy Key could encourage visitation to the Jones Lagoon area, although the difficulty in accessing this area and the specialized equipment and knowledge needed to safely traverse Jones Lagoon would keep the likelihood of this fairly low. Given

that visitation to both Soldier Key and Jones Lagoon would be expected to remain minimal, adverse impacts on the birds and their habitat would be minor. If visitation increases such that any state listed birds could be disturbed, management actions could include limiting access during nesting season to areas where birds are known to nest and/or establishing set-back distances following recommendations in scientific literature, since human disturbance has the potential to cause nesting birds to inadvertently crush their eggs while fleeing or to temporarily or permanently abandon their nests, thereby exposing the eggs to predators and extreme temperatures.

The proposed slow speed zone on the northern bay side of Elliott Key would be expected to reduce the likelihood of disruptions to birds using the coastal areas immediately adjacent to this zone. As a result, beneficial effects on state listed birds in the immediate area would be expected.

Under this alternative, birds using coastal habitats along the park's mainland shoreline would receive protection from potential boat-related disturbances from (1) the noncombustion engine use zone that extends 500 feet east from the mainland (excluding Black Point, Convoy Point, and Turkey Point Channels), and (2) a slow speed zone covering the area 500 to 1,000 feet from the shoreline. These two zones would be expected to reduce potential boat-related disturbances to birds that are roosting, nesting, foraging, and/or loafing along the mainland shoreline.

Overall, this alternative, including any necessary mitigation would probably result in long-term, negligible, adverse due to the proposed development in this alternative. There would be beneficial impacts on state listed bird populations and nesting activity in the park due to the establishment of protective zones around the above mentioned keys.

Cumulative Impacts. Large-scale habitat loss is an ongoing impact throughout the region, which resulted in the classification of many bird species as state listed. The establishment of Biscayne National Park has provided increased habitat protection for bald eagles and state listed birds in the park—a long-term, beneficial impact.

Alternative 2 would result in negligible impacts on listed birds due to increased visitor use and construction of minor visitor facilities. When combined with the impacts of other past, present, and future actions, the overall cumulative effect would be minor and adverse. This alternative would have a small contribution to the overall cumulative effects.

Conclusion. Under this alternative there would be proposed development that could result in long-term, negligible, adverse impacts on state listed species and would not be likely to lead to federal listing. There would be beneficial impacts to state listed birds through protective zoning that would reduce the likelihood of disturbance in important bird habitats caused by visitor activities.

Terrestrial Vegetation

Under this alternative, adverse impacts on terrestrial vegetation on the keys, particularly the hardwood hammocks, would be greater than for alternative 1. Boca Chita, Elliott, Adams, and Porgy Keys would be managed for visitor access and recreation. Visitation to these keys would be expected to increase because visitor services would be concentrated in these areas. Impacts from increased visitation could include trampling of vegetation and social trails. In general, these impacts could be mitigated by visitor education efforts and trail design to keep visitors on the existing trails. With mitigation measures in place, the impacts would be long term, negligible to minor and adverse.

The proposed development on Boca Chita, Elliott, Adams, and Porgy Keys would be kept within areas that have been previously disturbed to the extent practicable. Access to the Jones homesite on Porgy Key would be managed to minimize impacts on sensitive

resources. Some localized impacts could occur, but the adverse impacts on vegetation on the keys would be minimal. Any areas cleared during construction would be revegetated to minimize the long-term adverse impacts of the proposed development. The adverse impacts on vegetation on the islands from proposed development would be localized and negligible.

Under this alternative, the hiking trail on Elliott Key would be hardened from Petrel Point north to just past University Dock, approximately 5 miles. Because the trail already exists, impacts on the vegetation would be minimized and larger trees near the trail avoided to the extent possible. The trail could also be constructed to minimize changes in drainage that could occur because the trail has been hardened. With mitigation, the impacts on the vegetation would be adverse and negligible to minor in the long term.

Under alternative 2, three new primitive campsites and connecting primitive trails would be developed on Elliott Key. Although the infrastructure to support these campsites would be minimal, there would be hardened trails to the campsites. These trails would be developed to minimize the development of social trails, although they could still occur, and minimize the overall impact on vegetation. The impacts of these trails would be mitigated through site design. The impacts of vegetation removal for the proposed campsites would be adverse but negligible to minor in the long term. The impacts of vegetation removal for the proposed hardening of existing trails would be long term, adverse, and negligible. Some revegetation would occur as well.

Potential development of a food concession on shore at Elliott Key would have adverse impacts on vegetation. The impacts on vegetation would depend on the site chosen and the footprint associated with the development. The impact could be minimized by building on areas that have been previously disturbed or where minimal vegetation removal would be required. Because the exact location is not known, it is not possible to evaluate the impacts at this time. Before the development of a food concession on Elliott Key, additional environmental compliance would be conducted to determine the impacts on vegetation and other resources.

Under this alternative, much of the mainland shoreline, Sands Key, and the islands surrounding Jones Lagoon would be zoned as nature observation zones and visitation would be allowed, however protection would be emphasized. This expected to have a long-term beneficial impact on terrestrial vegetation on these islands.

Cumulative Impacts. Creation of Biscayne National Park has resulted in long-term benefits to terrestrial vegetation by maintaining some undeveloped areas.

An exotic plant management plan has been developed for Biscayne National Park and eight other national parks in the region. Exotic invasive plant species can change the structure and function of native plant communities. These changes can have an adverse impact on habitat for native species that rely on native plant communities. Vegetation disturbances caused by social trails and trampling of native vegetation encourages growth of invasive species. Removal of nonnative species would provide better conditions to reestablish native vegetation in disturbed areas, which could help mitigate the adverse impacts associated with social trails in the park. Implementation of this plant management plan would have a beneficial impact on terrestrial vegetation in the park and the habitat it provides.

When the negligible to minor adverse impacts of alternative 2 are combined with the impacts of other past, present, and future actions, the resulting cumulative impacts would be beneficial. This alternative would slightly reduce these beneficial cumulative impacts.

Conclusion. Implementing this alternative would result in long-term, negligible to minor, adverse impacts on terrestrial vegetation in

localized areas associated with minor construction projects and continued or increasing visitor use.

Wetlands

Wetlands in the park would continue to serve as an important habitat area for a wide variety of terrestrial and aquatic species in the park. Placement of the nature observation zone along the mainland would give greater protection to mangrove shorelines. This would have long-term, minor, and beneficial impacts.

Under this alternative, a shoreline boardwalk would be developed through the mangrove forest to link the canals in the park. Construction of the boardwalk would cause both short-term and long-term impacts on the wetlands along the mainland shoreline. During construction, there would be short-term adverse impacts on water quality from increased turbidity. Increased turbidity in the water column would temporarily degrade the habitat for aquatic species, which could also impact terrestrial species, particularly birds. These adverse impacts would be minor to moderate but localized.

Long-term impacts would result from the removal of mangroves and other wetland plants and the shading of seagrasses, mangroves, and other vegetation from the boardwalk that could reduce the type and density of the mangroves near these developments. The localized adverse impacts would be long term and minor.

No additional access into the mangroves that fringe the keys would be developed under this alternative, so there would be no change in the current size, integrity, or continuity of the wetland areas in the park. Mangroves are extremely difficult to walk through and so the proposed visitor facility improvements at Porgy, Adams, Elliott, and Boca Chita Keys might attract more visitors but are not likely to affect the wetlands.

Cumulative Impacts. The Biscayne Bay Coastal Wetlands Project of the Comprehensive Everglades Restoration Plan includes pump stations, spreader swales, stormwater treatment areas, flow ways, levees, culverts, and backfilling canals in southeast Miami-Dade County and covers 13,600 acres from the Deering Estate south to the Turkey Point Power Plant. The purpose of this project is to rehydrate wetlands and reduce point source discharge to Biscayne Bay. The proposed project would replace lost overland flow and partially compensate for the reduction in groundwater seepage by redistributing, through a spreader system, available surface water entering the area from regional canals. The proposed redistribution of freshwater flow across a broad front is expected to restore or enhance freshwater wetlands, tidal wetlands, and near-shore bay habitat. Sustained lower-than-seawater salinities are required in tidal wetlands and the near-shore bay to provide nursery habitat for fish and shellfish. This project is expected to create conditions that would be conducive to the reestablishment of oysters and other components of the oyster reef community.

Diversion of canal discharges into coastal wetlands is expected not only to reestablish productive nursery habitat along the shoreline but also to reduce the abrupt freshwater discharges that are physiologically stressful to fish and benthic invertebrates in the bay near canal outlets. The impact of these actions once implemented would be beneficial for wetlands inside and outside the park.

The actions proposed in the Biscayne Bay Coastal Wetlands Project could improve the overall health of the wetland areas along the mainland shoreline such that the system as a whole is better able to accommodate the stresses associated with the short- and long-term impacts of the development and human use in the area.

This alternative would contribute minor adverse impacts to the beneficial impacts of other present and future actions resulting in a beneficial cumulative impact. The

contribution of this alternative to these beneficial cumulative impacts would be small and adverse.

Conclusion. Proposed development would have a long-term, minor, adverse impact on the wetlands along the mainland coast of the park, particularly the mangroves. Short-term impacts associated with construction would continue to be adverse but minor to moderate and localized. Long-term impacts would be mitigated through design and would be adverse but localized and minor.

Submerged Aquatic Communities

In the waters of the multiuse zone, impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include impacts on submerged aquatic communities caused by boating and fishing and associated marine debris. These impacts would continue to be long term, minor to moderate, and adverse.

Under this alternative, there would be greater controls on speed and vessel types in areas where there are submerged aquatic communities, particularly seagrass beds.

The area extending 500 feet from the mainland shoreline, the bay side of Elliott Key from Sands Cut to Elliott Key Harbor, and the waters within Jones Lagoon and around Totten Key to Cutter Bank Shallows would be zoned for noncombustion engines only. The aquatic community nearest the mainland shore is seagrass, and the waters in Jones Lagoon to Totten Key and Cutter Bank Shallows have a combination of both the seagrass and hardbottom communities. Compared to alternative 1, the potential for adverse impacts on these communities would be reduced because there would be fewer boats in the area and boats would be moving relatively slowly. Losses in productivity in these areas would be less because of the reduced potential for scarring and turbidity. The long-term impacts on submerged aquatic communities in these areas would be beneficial.

The West, Middle, and East Featherbed Banks would be designated a slow speed zone, as would the area 500 feet to 1,000 feet adjacent to the noncombustion engine use zone along the mainland shoreline. The slow speed zone would reduce the potential for scarring the seagrass beds as well as increasing turbidity in the water column, thus minimizing adverse impacts on the productivity of this habitat and water quality in the area.

The waters around Porgy Key are exceedingly shallow and have abundant benthic life such as small corals, sponges, and marine plants. As a result of increased visitation to Porgy Key, impacts on this marine benthic community would be long term, minor, and adverse.

The proposed Convoy Point boardwalk would result in removal of wetland plants and have shading impacts on seagrasses and other aquatic life. Impacts would be long-term, minor and adverse.

The addition or relocation of mooring buoys and boundary markers would result in short-term, minor adverse impacts in specific areas associated with underwater installations and associated impacts to submerged substrates, although mooring buoys and boundary markers would be placed in locations away from corals, seagrass beds, and submerged cultural resources. Increased public outreach and/or law enforcement efforts would probably reduce the potential for illegal anchoring that could impact submerged aquatic communities and thus is a beneficial impact.

Overall, the health of the seagrass beds would be expected to increase under this alternative because of the increased areas zoned for slow speeds and noncombustion engines. The increased health of seagrass beds would be a long-term beneficial impact.

Cumulative Impacts. Boat groundings and anchoring have damaged seagrass beds, coral

reefs, and hardbottom communities, and degraded habitat for fish, shrimp, crabs, lobsters, and other invertebrates that inhabit these areas.

Coral reefs are complex ecosystems and sensitive to disturbances. Fishing, snorkeling, and scuba diving can also have adverse impacts on coral reef systems. The damage caused by these activities includes scarring from boat propellers and inadvertent placement of anchors, as well as breakage caused by snorkeling and scuba diving. Fishing gear and debris can break, smother, and entangle benthic resources on coral reefs and in seagrass meadows. Fishing also results in removal of predators and the removal of herbivorous fish that keep algae minimized (contributes to reef health). Damage to the coral reefs also adversely impacts other species that rely on the reefs for food and shelter. Damage to the seagrass beds, hardbottom communities, and coral reefs would continue to be a long term, minor to moderate, and adverse impact.

Alternative 2 would result in long-term beneficial impacts. When combined with the adverse impacts of other past, present, and future actions, the cumulative impacts would be minor to moderate and adverse. The contribution of this alternative to these cumulative impacts would be small.

Conclusion. Alternative 2 would continue existing, minor to moderate adverse impacts to seagrass beds and corals in much of the park zoned for multiuse. However, in areas zoned for resource protection, impacts would be reduced resulting in long-term beneficial impacts on submerged aquatic communities.

Soundscapes

In the waters of the multiuse zone impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include short-term, minor to moderate adverse impacts caused by boat noise on the water as well as short-term negligible adverse impacts caused by vehicles and routine maintenance equipment on land. In both cases, these noises can transcend the zone in which they originate and be heard in adjacent zones.

Natural soundscapes predominate in the distant portions of the park, away from popular boating routes. Increases in visitation on weekends and during special events add to the number of boats on the bay at one time. Increased boating from a generally increasing human population as provided in county and city plans would be expected to result in increased boat engine noise. Impacts associated with an increased number of boats in the park would be short term, minor to moderate, and adverse.

Under alternative 2, there would be areas of the bay zoned for slow speed or noncombustion engine use. Because these restrictions would reduce the level and duration of noise from boats, there would be long-term, beneficial impacts on soundscapes on portions of the bay and adjacent land.

There would be a limited amount of new construction in this alternative occurring mostly in the visitor services and park administration zone. This would result in short-term, localized, adverse impacts that would be minor in intensity. Long-term impacts from use of new development such as trails and boat launches would be adverse but negligible.

Existing natural soundscapes in the interior of the larger keys would continue to be preserved by protective zoning and relatively low visitor use—a continuing beneficial impact.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar as those described under alternative 1. The beneficial and adverse impacts of alternative 2, in combination with the adverse impacts of other actions, would result in minor and adverse cumulative impacts on the natural

soundscape; however, the contribution of this alternative to these impacts would be a slight reduction of these adverse cumulative impacts.

Conclusion. Implementing alternative 2 would have long-term beneficial impacts on soundscapes due to protective zoning. Short-term negligible to minor, adverse impacts during construction and existing minor to moderate adverse impacts on natural soundscapes would continue as a result of persistent boat-related noise in much of the park. Existing negligible, short-term adverse impacts on natural soundscapes would continue as a result of routine park operations and maintenance activities.

CULTURAL RESOURCES

Archeological Resources (including submerged archeological)

Implementation of this alternative would have similar impacts on archeological resources as those listed in alternative 1. The strong emphasis on cultural resource protection could be expected to have some additional beneficial impacts on archeological resources (including submerged archeological) sites. Actions under this alternative, such as exclusion of visitors from West Arsenicker, Arsenicker, and Swan Keys, would generally contribute to beneficial impacts on potential and known terrestrial and submerged archeological sites. These added protections would provide far less potential for treasure hunting, looting, amateur collection, and inadvertent visitor impacts.

Under alternative 2 archeological resources could be adversely impacted by the following specific actions on keys selected as principal visitor destination points:

- expanded recreational development for day use and camping and adaptive use of historic Boca Chita Key
- development and upgrading of new and existing trails, establishment of primitive campsites and connecting primitive trails, and installation of composting toilets and visitor kiosks on Elliott Key
- improved visitor services and facilities and development of a small commercial visitor services facility and staging area for paddlecraft on Adams Key
- construction of a dock to facilitate vessel access on Porgy Key

All ground-disturbing activities would be preceded by site-specific archeological surveys and, where appropriate, subsurface testing to determine the existence of archeological resources and how best to preserve them. Known archeological resources would be avoided to the greatest extent possible. Few adverse impacts on archeological resources from construction would be anticipated, but any adverse impacts would be permanent and negligible to minor in intensity.

Although ongoing and expanded archeological site monitoring programs would be initiated and efforts would be undertaken to minimize or mitigate potential impacts from human activities, increased recreational use and access to areas of the park could result in the disturbance of archeological resources because of inadvertent visitor impacts or vandalism. A loss of surface archeological materials, alteration of artifact distribution, and a reduction of contextual evidence could result. Continued ranger patrols and emphasis on educating the general public and scuba diving community regarding the significance and fragility of archeological resources would discourage illicit activities and inadvertent impacts and help minimize adverse impacts. Adverse impacts would primarily be negligible to minor and permanent.

Although stabilization/interpretation of the Jones homesite historic ruins on Porgy Key would enhance protection of those

archeological resources as a beneficial impact, more visitors would be drawn to the area, thus increasing the possibility of disturbance, degradation, or loss of resources as a result of inadvertent human activities or vandalism at a site that was formerly protected by its isolation and relative inaccessibility. The latter would be a long-term, minor, adverse impact.

Provision for a wide variety of expanded recreational activities on most of the park's water acreage, Elliott Key (not including the visitor services / park administration zone), and the mainland between Convoy Point and Black Point Park could result in disturbance, degradation, or loss of resources associated with the Offshore Reefs Archeological District as well as other submerged and terrestrial archeological resources scattered throughout the park.

Archeological (and submerged archeological) resource protection would be a high priority in the nature observation zone that would be managed to limit intensive visitor use. Under this alternative, this includes three mainland areas and Ragged, Sands, Rubicon, Reid, Old Rhodes, Totten, Gold, East Arsenicker, Long Arsenicker, and Mangrove Keys. Nevertheless, self-directed visitor activities designed to immerse visitors in relatively remote surroundings would potentially subject known and unknown archeological (terrestrial and submerged archeological) resources in the park to disturbance as a result of inadvertent human activities or vandalism because visitors would be drawn to areas that were formerly closed to visitors or protected by their relative isolation.

Reduction of Legare Anchorage to about 1 square mile would continue to afford protection to sensitive underwater archeological resources in the Offshore Reefs Archeological District. Better navigational markings and more logical coordinate-based designation of the protected zone might result in improved public compliance with the regulations in Legare Anchorage and closure of Legare Anchorage to commercial trapping would reduce resource damage from snagged gear. These steps could be expected to provide additional protection that would result in a long-term and localized beneficial impact on archeological resources.

Potential archeological resources on West Arsenicker and Arsenicker Keys and in the water extending out 500 feet from them and on Soldier and Swan Keys would continue to be protected by keeping them closed to visitors and only permitting research under a permit. This continued protection would provide a long-term and localized beneficial impact on archeological resources.

Cumulative Impacts. Impacts associated with other past, present and reasonably foreseeable actions would be the similar to those described under alternative 1. As described above, implementation of alternative 2 would result in permanent, negligible to minor, adverse impacts and beneficial impacts. The impacts of alternative 2, in combination with both the long-term, negligible to minor adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a permanent, negligible to minor, adverse cumulative effect. The adverse impacts of alternative 2, however, would be a small component of the adverse cumulative impact.

Conclusion. Implementation of this alternative would have the similar impacts on archeological resources as those listed under alternative 1. The strong emphasis on cultural resource protection and protective zoning could be expected to have some additional, long-term beneficial impacts on archeological sites.

Section 106 Summary. The implementation of this alternative could include some minor adverse impacts on archeological resources. If impacts remain minor there would be no adverse effects under section 106. Any adverse impacts resulting from moderate or major impacts would be mitigated through the use of *The Secretary of the Interior's Standards for the Treatment of Historic Properties* and a

memorandum of agreement with the state historic preservation office and Advisory Council on Historic Preservation to counteract such adverse effects.

Historic Structures and Buildings

Implementation of this alternative would have similar impacts on historic structures and buildings in Boca Chita Key Historic District, Jones Family Historic District, and at Fowey Rocks Lighthouse as those listed under alternative 1 because the structures and buildings would be rehabilitated, preserved, and adaptively used in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. However, some minor elements of historic fabric could be lost as a result of remodeling/ rehabilitation efforts, and anticipated increasing visitation levels could result in loss of some historic fabric from inadvertent visitor use or vandalism. As with alternative 1, impacts on historic structures and buildings would be localized, long-term to permanent, generally beneficial, and of negligible to minor intensity.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. As described above, implementation of alternative 2 would result in negligible to minor adverse impacts as well as some beneficial impacts. The impacts of alternative 2, in combination with negligible to minor adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long- and short-term beneficial impact. The adverse impacts of alternative 2, however, would be a small component of the adverse cumulative impact.

Conclusion. Implementation of this alternative would have similar impacts on historic structures and buildings in the Boca Chita Key Historic District as those listed under alternative 1. As with alternative 1, impacts on historic structures and buildings would be localized, long-term to permanent, and generally beneficial. Implementation of this alternative would have a long-term, beneficial impact on the Fowey Rocks Lighthouse because it would be preserved in accordance with the Secretary's Standards.

Section 106 Summary. The implementation of this alternative could include some minor adverse impacts on historic structures and buildings. If impacts remain minor there would be no adverse effects under section 106. Any adverse impacts resulting from moderate or major impacts would be mitigated through the use of *The Secretary of the Interior's Standards for the Treatment of Historic Properties* and a memorandum of agreement with the state historic preservation office and Advisory Council on Historic Preservation to counteract such adverse effects.

Cultural Landscapes

Implementation of this alternative would have similar impacts on cultural landscapes in the park as those listed under alternative 1 because potential landscapes would continue to be surveyed, inventoried, and evaluated under National Register of Historic Places criteria of evaluation, and the National Park Service would implement resource management policies that preserve the natural resource values and culturally significant character-defining patterns and features of Boca Chita Key, Porgy, and Totten Keys, or other listed, or determined eligible, landscapes in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties With Guidelines for the Treatment of Cultural Landscapes*.

Enhancement of Boca Chita Key as a visitor destination point and park administration center could result in some loss to the integrity of the key's cultural landscape, which would be a long-term, negligible to minor, adverse impact. Additionally, some minor elements of the historic scene in the Boca Chita Key Historic District could be impacted by rehabilitation and adaptive use of the

historic structures for purposes that are inconsistent with historic use of the area, new facility construction that is incompatible with the district's historic structures, and anticipated increasing levels of visitation, which would also be long term, negligible to minor, and adverse.

Enhancement of recreational opportunities to attract increasing numbers of visitors to Elliott Key through development and upgrading of new and existing trails, establishment of primitive campsites, and installation of composting toilets and visitor kiosks could have some long-term, minor adverse impacts on the Sweeting Homestead's potential cultural landscape.

Minor elements of the potential cultural landscape at the Jones homesite historic ruins on Porgy Key could be compromised because interpretation of and hardened trail access to the ruins would draw growing numbers of visitors to a remote site that has been largely inaccessible. These impacts would likely be short-term to long-term, minor, and adverse. However, restoration activities on a potential landscape at the Jones homesite would have localized, long-term beneficial impacts as well. Construction of a dock on Porgy Key could have short-term to long-term minor adverse impacts on the potential cultural landscape's historic scene.
Enhancement of recreational opportunities and visitor facilities throughout much of the park's lands and waters could result in some additional long-term, minor, adverse impacts on the integrity of the potential parkwide maritime cultural landscape.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. As described above, implementation of alternative 2 would result in negligible to minor, long-term, adverse impacts and beneficial impacts. The impacts of alternative 2, in combination with long-term, negligible to minor adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term, negligible to minor, cumulative impact. The adverse impacts of alternative 2, however, would be a small component of the adverse cumulative impact.

Conclusion. Implementation of this alternative would have similar beneficial impacts on cultural landscapes as those listed under alternative 1. Expanded recreational use; enhanced visitor services, facilities, and access; and increased development could have some long-term, negligible to minor, adverse impacts on the integrity of the park's potential cultural landscapes.

Section 106 Summary. The implementation of this alternative could include some minor adverse impacts on cultural landscapes. If impacts remain minor there would be no adverse effects under section 106. Any adverse impacts resulting from moderate or major impacts would be mitigated through the use of *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes* and a memorandum of agreement with the state historic preservation office and the Advisory Council on Historic Preservation to counteract such adverse effects.

VISITOR EXPERIENCE

Diversity of Visitor Activities

Under this alternative, visitors would continue to have unrestricted access (as described in the multiuse zone [water]) to most of the park's waters (approximately 95%) to participate in a wide range of recreational opportunities such as motorboating, sailing, paddling, swimming, scuba diving, snorkeling, fishing, and nature study. The remaining park waters would have some restrictions or changes (existing and new) that would potentially enhance, modify, limit, or prohibit some visitor access and activities.

This alternative would require visitors to maintain slow speeds along the mainland

shore and at Sands Cut. This would continue the long-term beneficial impacts of visitor safety and manatee protection. This alternative would also add a slow speed zone to Caesar Creek and the East, Middle, and West Featherbed Banks area west of Boca Chita Key. This additional slow speed zone would help increase visitor awareness of this relatively shallow and sensitive area of the bay. Slower speeds in the Featherbeds would reduce the frequency and severity of boat groundings, which would be a long-term beneficial impact on the quality and safety of some visitor experiences. Some visitors would have boats with too deep a draft to be able to operate successfully at slow speeds in these areas and would be excluded from access. For some visitors this additional formal restriction would be perceived as a long-term, minor, adverse impact on their visitor experience while boating in the park. The total area of park waters that would have slow speed restrictions would be about 1.2%.

The noncombustion engine use zone would include two areas—waters within 500 feet of the mainland and the Cutter Bank / Jones Lagoon area. This zone would have impacts that are similar to the slow speed zone but would require boaters to pole or use an electric trolling engine. Some visitors would have boats with too deep a draft to be able to operate successfully at the slow speeds required from using a noncombustion engine and would be excluded from these areas. For some visitors this change would be perceived as a long-term, minor, adverse impact on their visitor experience while boating in the park. Other visitors would benefit over the long term because the resulting decrease in noise, speeds, and number of motorboats would enhance visitor safety and opportunities to quietly explore the mangroves and lagoons by paddlecraft, observe wildlife, experience the natural sounds of the marine environment, and find solitude. Also, boaters would have less likelihood of grounding in this zone, and flats anglers would have improved conditions for successful catches—long-term beneficial impacts.

Under this alternative, Legare Anchorage would be reduced in size relative to current conditions. This would result in visitors having access to an additional 1,700 acres of reef waters for a full range of recreational activities (in the multiuse zone). The sensitive underwater archeological zone, which would be applied to a smaller area of Legare Anchorage, would allow for limited visitor access, which is currently the case. The addition of 1,700 acres to the multiuse zone would provide visitors enhanced opportunities for access and recreation, which would be a long-term beneficial impact on visitors' abilities to access and recreate in park waters.

The continued closure of West Arsenicker Key, Arsenicker Key, and adjacent waters to visitation would not change. What would change under this alternative would be the application of the sensitive resource zone to 500 feet out from the keys shorelines. This would be a slight increase over the current 200-foot closure. Also, Swan Key would be closed to visitors. This island is currently lightly used; however, those visitors who enjoy the current unrestricted access might find this closure to be a long-term, minor, adverse impact on visitor's access to travel throughout the park.

The northern and southern sections of the mainland, most of the southern keys, and all of Sands Key would in the nature observation zone. The relative inaccessibility of the mangrove forests naturally limits the range of visitor activities. Most visitors to these areas would likely experience few interactions with others and would have opportunities to explore, observe nature, and find solitude. This in general would result in little change over current visitor experience conditions. Also, Sands Key is currently closed to the public. Making it available to the public would be a long-term beneficial impact on visitors' abilities to access and enjoy park resources.

Visitor Services and Facilities

The addition of a viewing platform and mangrove boardwalk at Convoy Point would substantially increase visitors' opportunities to walk, fish from shore, enjoy the scenery, and explore and learn about mangrove habitat. These additions would enhance the range and quality of recreational and interpretive opportunities available in the Convoy Point area and potentially extend the length of a person's visit. These facilities would be long-term beneficial enhancements to the visitor experience, especially for visitors who do not have the time, ability, or means to visit outlying park resources.

Both Porgy Key and Adams Key would be zoned for visitor services. Providing a concessioner transport service to either island with opportunities for commercial paddlecraft rentals would substantially enhance opportunities for visitors to safely access and explore the adjacent noncombustion engine use zone in and around Jones Lagoon and the southern keys. Dock improvements, improved trails, cultural resource stabilization, and interpretation could happen at either Adams Key or Porgy Key. Primitive camping and a general store would be considered for Adams Key. These services, facilities, and enhancements would be a long-term beneficial impact on visitors' recreational opportunities in the southern sector of the park and enhancing opportunities for education, solitude, and nature observation. Although it is anticipated that this type of service would increase the number of encounters between visitors, the size and character of this area of the park would enable easy dispersal and separation of groups most of the time.

The substantial amount of trail hardening throughout Elliott Key would considerably improve the accessibility of most of the island to visitors and support the broader opportunities available in multiuse zones. Providing primitive campsites at the more remote cove areas would offer additional opportunities for visitors to experience a more rugged, backcountry, maritime environment. Provision of visitor services such as toilets, kiosks, and a possible food concession, as well as the amenities above, would in general make Elliott Key much more attractive as a destination within the park. Visitation would likely increase, and there would be an increased frequency of visitor encounters. In general, these changes would have long-term beneficial impacts on visitor experience. However, the experience of some visitors who are attracted to the island for purposes of solitude and nature study would potentially perceive minor adverse impacts because of the additional activity and visitor levels.

All of Boca Chita Key would be included in the visitor services / park administration zone. This alternative would entail a substantial increase in docking and mooring capacity and retaining wall improvements. Increased docking capacity would provide opportunities for more visitors to access and recreate on the island. The improved access would likely result in increased visitor encounters and an overall increase in yearly visitation. Reuse of historic structures in lieu of new construction would be a positive impact on visitor experience because it would maintain the historic integrity and ambiance of the cultural landscape and opportunities for visitors to learn about and understand past use of the key. Given the popularity of Boca Chita Key, increasing visitor access to and visitor services on this key would be a long-term beneficial impact on visitor access and use. Construction of docking facilities and accompanying noise would likely cause short-term, minor, negative impacts on visitors.

In this alternative, visitors, especially those with their own boats who normally would not visit Convoy Point, would have substantially increased opportunities to access information about the park before entering. The placement or enhancement of visitor information points at locations outside the park would help visitors learn about the park and any regulations or necessary permits, and would help them plan their visit in advance;

thus they could use their time more efficiently and potentially have a more enjoyable visit.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. The actions of this alternative, especially park zoning that could enhance resource conditions, such as the slow speed, noncombustion engine use, sensitive resource, and nature observation zones, combined with ongoing regional efforts described in alternative 1 would have the potential positive cumulative impact of improving the quality of visitor activities in the region, especially related to fishing, nature viewing, and other resource-based recreational activities. There would also be improved visitor opportunities to learn from various sources regarding the importance and complexity of restoration efforts in a rapidly growing urban environment.

The actions of this alternative to improve access and recreational opportunities and facilities, as well as the satellite visitor information sites, would have a small beneficial contribution to the impacts of more and better public information about, and access to, the Biscayne Bay area and enhanced opportunities to learn about and recreate there. This alternative, when combined with the impacts of other actions, would result in beneficial cumulative impacts on visitor experience in the area. Alternative 2 would have a slight contribution to these cumulative impacts.

Conclusion. Additional speed restrictions and new noncombustion engine requirements would potentially exclude some visitors from these areas, which would be a long-term, minor, adverse impact. The slow speed and noncombustion engine use zones would help over time to separate conflicting visitor uses, increase boating safety, and increase nonmotorized recreational opportunities. These would be long-term beneficial impacts on some visitors' experiences. The upgrade of visitor services and facilities would substantially enhance opportunities to learn about, access, and safely recreate in the park. These would be long-term beneficial impacts on most visitors' experiences. This alternative, when combined with the impacts of other actions, would result in beneficial cumulative impacts on visitor experience in the area. Alternative 2 would have a slight contribution to these cumulative impacts.

NPS OPERATIONS AND FACILITIES

Actions under alternative 2, with its emphasis on recreational use by providing a high level of services and facilities and access to specific areas of the park while providing for resource protection, would generally result in construction of new facilities, acquisition of new equipment, continuing maintenance of the new facilities and equipment, and employment of additional law enforcement, resource management, maintenance, and interpretive staff. Construction of new facilities and acquisition of new equipment would generally require additional funding and have short-term, minor to moderate, adverse impacts on the park's budget. Similarly, maintenance of the new facilities and equipment and employment of additional personnel would require additional funding and thus would have long-term, minor to moderate, adverse impacts on the park's budget.

Under alternative 2 as many as 10 potential visitor information points would be developed outside the national park by establishing or upgrading visitor kiosks, signs, and interpretive programs at three county parks, one state park, and five or six other sites still to be determined, including the possibility of constructing a dock for paddlecraft access and storage at Old Cutler Road. Because NPS personnel would be provided at some of these potential sites, and interpretive and educational materials would be needed at the sites, such actions would have long-term minor adverse impacts on the park's budget. Under alternative 2 new visitor facilities would be constructed at various destination points in the park, and such facilities would

require long-term maintenance and thus have both short-term and long-term, minor to moderate, adverse impacts on the park's budget. These facilities would include the following:

- Convoy Point – Construct new viewing platform and boardwalk along mangrove shoreline and catwalks over mangrove forests connecting canals, and reconstruct jetty boardwalk
- Porgy Key – Improve and extend dock; improve Jones homesite for visitation, and develop on-site interpretive media; and consider as potential site for commercial operations such as visitor dropoff from appropriate shallow-draft concessions boats
- Adams Key – Provide new staging/ storage area for paddlecraft and primitive campgrounds; improve trails and dock; and possibly develop a general store
- Elliott Key – Harden trail from harbor to Sweeting Homestead for universal accessibility, construct hardened connecting trail to University Dock, develop three primitive campsite areas, and connect campsites to harbor with hardened trails, provide composting toilets and visitor kiosks, and consider as potential site for food concession
- Boca Chita Key – Adaptively reuse of more historic structures for park operations and visitor services, accommodate additional boats with mooring buoys, strengthen retaining wall on north side, and provide for shore beaching
- Visitor contact points developed outside the park – Kiosks, signs, possibly educational programs, and placement of NPS personnel at marinas and state/local parks

Additional staff would be required to provide enhanced visitor services and interpretive opportunities and to address resource management concerns on Porgy, Adams, Elliott, and Boca Chita Keys and on Convoy Point. Although more law enforcement and resource management personnel and equipment would be required to enforce park regulations and protect natural and cultural resources in the slow speed, nature observation, sensitive resource, and noncombustion engine use zones, it could be assumed that the successful implementation of these special zones would result in fewer groundings and resource damage and thus less commitment of park staff and budget in legal prosecutions and resource rehabilitation. Thus, impacts on park operations would be long-term, minor to moderate and adverse.

Cumulative Impacts. As discussed under alternative 1, past and ongoing cooperative planning and development projects in the Biscayne Bay region, such as the Biscayne Bay Partnership Initiative, Miami-Dade County Comprehensive Development Master Plan, and Biscayne Bay Strategic Access Plan, and NPS special resources studies, such as those for Miami Circle and Virginia Key Beach Park, have resulted in some long-term beneficial impacts on park operations and facilities. However, these beneficial impacts are almost impossible to measure.

This alternative, with its provision for additional facilities at visitor destination points in the national park as well as establishment of potential visitor contact points outside the park, in combination with the aforementioned beneficial impacts of past and ongoing cooperative planning and development projects in the Biscayne Bay region, would generally result in long-term, beneficial cumulative impacts on facilities and long-term minor adverse cumulative impacts on park operations; however, this alternative's contribution to these impacts would be small and beneficial for facilities and modest and adverse for park operations.

Conclusion. Overall, actions under alternative 2 would result in short-term and long-term, minor to moderate, adverse

impacts on park operations and facilities due to increased maintenance and operational demands for new zones and developments. The overall cumulative impacts would be long term beneficial for facilities and long term, negligible, and adverse for park operations. This alternative's contributions to these impacts would be small and beneficial for facilities and small and adverse for park operations.

SOCIOECONOMIC ENVIRONMENT

Full implementation of this alternative would require 20 additional full-time equivalent staff positions to handle the increased workload for interpretation, cultural resource management, natural resource management, law enforcement, administrative support, and maintenance. Actual staffing levels would reflect the availability of adequate budgets. Any additional employment, along with federal dollars that would be required to implement this alternative is expected to have a long-term beneficial impact on the regional economy.

Actions under alternative 2 would emphasize recreational use of the national park and provide for a relatively high level and broad diversity of visitor uses and experiences through new, expanded, and improved services (including concession services), facilities, and access to specific areas of the park. Due to these, the number of visitors and average length of visit would be expected to increase. Local businesses that rely on the tourist trade would be expected receive a long-term minor benefit. For example, every 1% increase in annual visitation would mean an increase of about $164,000 to the local economy through direct and indirect visitor spending each year. Adverse impacts now occurring on fishery resources and habitat in the park would be reduced under this alternative due to the additions of slow speed and noncombustion zones. The slow speed and noncombustion engine use zones would help over time to separate conflicting visitor uses, increase boating safety, and increase nonmotorized recreational opportunities. The expected long-term beneficial impacts on park fishery resources and habitat as well as on some visitors' experiences associated with the implementation of these zones would result in a long-term beneficial impact on the sustainability of local tourism and resource-based economic activities. Actions under this alternative do not address adverse impacts on park coral reefs. Johns et al. (2003) report that reef-related expenditures in Miami-Dade County generate $614 million in income and sustain 19,000 jobs in Miami-Dade County and generate nearly $4 billion dollars in sales in the southeast Florida region annually. These economic impacts would be expected to be negatively impacted by coral reefs health decline.

Similar to the no-action alternative, the continued presence of Biscayne National Park positively contributes to the value of surrounding private land.

Cumulative Impacts. Impacts associated with past and ongoing partnership and planning efforts would be similar to those described under alternative 1.

The proposed actions of this alternative to improve access and recreational opportunities and facilities, as well as the satellite visitor information sites, would support regional efforts in enhancing tourism and increasing visitor access and recreational opportunities in the area. The continuation of adverse impacts on submerged aquatic species, especially park coral reefs, has the potential to result in long-term, minor, adverse impacts on the economic benefits derived from these resources. This alternative, when combined with the impacts of other actions, would result in beneficial cumulative impacts on the regional socioeconomic environment. Alternative 2 would contribute a small increment to these cumulative impacts.

The long-term socioeconomic impacts of phasing out commercial fishing in the park are expected to be realized with the anticipated implementation of the *Fishery Management*

Plan and are assessed in that plan. For more information on the *Fishery Management Plan*, please visit http://www.nps.gov/bisc /parkmgmt/fishery-management-plan.htm.

Conclusion. Implementing alternative 2 would have long-term beneficial economic impacts in the region. The upgrade of visitor services and facilities would substantially enhance opportunities to learn about, access, and safely recreate in the park. These would be long-term beneficial impacts on the regional socioeconomic environment. Some of the adverse impacts now occurring to park fishery resources and fish habitat in the park would persist—a potential long-term, minor adverse impact on tourism and associated service-related businesses. The overall cumulative impacts would be beneficial. Alternative 2 would contribute a small increment to these cumulative impacts.

UNAVOIDABLE MODERATE OR MAJOR ADVERSE IMPACTS

Unavoidable adverse impacts are defined here as moderate to major impacts that cannot be fully mitigated or avoided. There would be no unavoidable moderate or major adverse impacts expected as a result of implementing alternative 2.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Alternative 2 would have a relatively high potential for some commitment of resources because it would involve new development (e.g., trails, dock, buildings, etc.). However, most of the development being proposed is trails and small facilities with only small areas of potential impact. Most proposed developments would be built in previously disturbed areas and would not result in substantial irreversible or irretrievable commitments of resources. Cultural resources would continue to be protected through active preservation maintenance.

NATURAL OR DEPLETABLE RESOURCES AND ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

Whenever feasible, the National Park Service strives to maximize the use of renewable resources and energy and therefore minimize the use of depletable resources. However, it is not possible with today's technologies to cost-effectively avoid all use of depletable resources in building and operating facilities. Because this alternative includes some level of construction, it would impact natural or depletable resources and energy to some extent. Generally, the amount of resources and energy used in a building is related to its size. Other park assets that support visitor use and resource protection, such as parking lots and trails, also potentially use depletable resources to some extent; however, the park's practice is to use wood or recycled material (renewable resources) for boardwalks. Increases or decreases to trails would not impact depletable resource or energy use. Only the change in the amount of square footage in buildings is used in this analysis to approximate the level of resource and energy use.

Implementing alternative 2 would involve a small increase in energy requirements because of the proposed buildings that would need energy to operate. This need would be reduced by the proposal to use solar or wind energy for electricity and so would be a minor increase in the park's energy use requirements and a negligible increase in the region.

IMPACTS OF IMPLEMENTING ALTERNATIVE 3

NATURAL RESOURCES

Fishery Resources

In the waters of the multiuse zone (water) impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include impacts on park fishery resources and fish habitat caused by boating and fishing in the park. These impacts would continue to be long term, minor to moderate, and adverse.

A noncombustion engine use zone would be established along the mainland shoreline, extending 500 feet, in the waters surrounding Totten and Rubicon Keys, Jones Lagoon, and the Cutter Bank Shallows. A slow speed zone would be designated over the West, Middle, and East Featherbed Banks and two areas accessible by permit only would be established north of Black Point County Park and on the west side of Elliott Key from Billy's Point to Sandwich Cove. These zones would limit the type of boats entering these waters and/or reduce boat traffic overall. This would reduce the impacts associated with boat traffic such as seagrass scarring and localized turbidity. This would be a long-term beneficial impact.

The west coast of Elliott Key from the southwest tip of Sands Key south to Elliott Key Harbor would be designated a slow speed zone. The number of boats entering this area would be reduced because not all boats would be able to travel at slower speeds in the shallow water. The slow speed zone would reduce the potential for scarring in the seagrass beds in this area as well as reduce the potential for turbidity in the water column, thus minimizing adverse impacts on the productivity of this habitat and water quality in the area. The slow speed zone would have a beneficial impact on the quality of fish habitat in this area.

A marine reserve zone where fishing is not allowed would be managed to preserve and improve natural resources. The designation of a marine reserve zone would prohibit commercial and recreational fishing in about 10,502 acres, or about 6% of total park area. About 37% of the park's hardbottom habitat would be within this zone, and 63% would be available for fishing outside of the marine reserve zone. This locally reduced fishing pressure, where fish species could grow larger and therefore exponentially increase in reproductive output, would result in a long-term beneficial impact on park fishery resources.

Even though fishing pressure may increase outside this zone, the anticipated increase in size and abundance of fish within the marine reserve zone is expected to have a spillover effect outside the zone, as documented in other marine reserve zones worldwide. Research has shown that marine reserves deliver a wide range of benefits to conservation, science, and general management. Marine reserves allow not only for the recovery of fish species/stocks, they provide sufficient protection for the ecosystems they encompass (Bohnsack 1996).

Species in both the bay and the reefs outside the marine reserve zone would continue to experience substantial pressures from both commercial and recreational fishing; however, when the *Fishery Management Plan* is fully implemented, commercial fishing would be phased out over time. Some fish would continue to be overfished or subject to overfishing. These impacts would continue to be adverse and minor to moderate in the long term.

There would be an increase in the number of people fishing from the shoreline if a new boardwalk was built facing the bay waters. This would be expected to have a long-term,

negligible, adverse impact on park fishery resources.

This alternative would provide a greater benefit to fishery resource habitat in the seagrass than alternative 1 because a larger area for seagrass beds in the park would be included in protective zoning designation.

These zones include the noncombustion engine use zone, the slow speed zone, and the marine reserve zone , all of which contain seagrass beds.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be the similar to alternative 1. The reduction of adverse impacts from human activities on coral reefs and associated ecosystems, combined with efforts from the United States Coral Reef Task Force, would generally result in beneficial impacts. However, the intensity and duration of the cumulative impact of the above planning efforts would depend on the actual number and type of actions taken to implement the identified fundamental themes.

The fishing prohibition in the marine reserve zone, combined with similar prohibitions and/or restrictions in waters outside the park boundary, could increase fishing pressure and related impacts of overfishing and marine debris in the few reef patches still open to fishing. This could be a long-term, moderate adverse impact to those overfished reefs, but the overall impact to fish populations and fish habitat would be mitigated by the protection of prime reefs which serve as nursery grounds to maintain populations of fish species, as well as by the anticipated spillover effect of fish populations from the marine reserve.

This alternative would contribute a beneficial impact to the beneficial impacts of other past, present, and future actions resulting in beneficial cumulative impacts.

Conclusion. Long-term, minor to moderate, adverse impacts now occurring to park fishery resources and fish habitat in the park would persist in most of the park waters. Such impacts would be dramatically reduced in areas of protective zoning, particularly in the marine reserve zone, resulting in a long-term, beneficial impact to fish and fish habitat in some locations. There would be no new adverse impacts from proposed management actions.

Threatened and Endangered Species

Manatee. Manatees are more likely to be found in the warm waters closest to shore, so there would continue to be a 1,000-foot manatee protection area in the waters nearest the shoreline. The manatee protection area would be modified so that the 500 feet nearest the shoreline would be designated a noncombustion engine use zone and the remaining 500 feet would be designated a slow speed zone. Within the noncombustion engine use zone, management would focus on protecting water-based resources and minimizing visitor use impacts. This zone would provide additional protection to the manatee by reducing the potential for boat-related injuries and mortality in the areas where manatees are most likely to occur. The slow speed zone would provide boat operators a greater opportunity to avoid collisions with manatees that are farther from shore by increasing their response time. The slow speed and noncombustion engine use zones under this alternative would result in fewer boat groundings in seagrass beds, an important habitat/food source for manatees.

The modifications to the manatee protection area and other zoning would have a long-term, beneficial impact on manatees and manatee habitat in the park.

Section 7 Determination of Effect— The impacts on the manatee under alternative 3 would be small, localized, and beneficial. Measurable beneficial outcomes on individual manatees and the manatee population because of the protective zones are likely. The determination of effect is “may affect, not

likely to adversely affect" for manatee under alternative 3.

Sea Turtles. In the waters of the multiuse zone (water), impacts described in the no-action alternative (alternative 1) would be expected to persist. These impacts include potential for collisions with boats, strangulation and entanglement with marine debris (including lobster and crab traps), hook-and-line fishing, and vessel groundings on sea turtle foraging habitat (coral and seagrass), which may adversely affect sea turtles, particularly loggerhead, hawksbill, and green species. Leatherback and Kemp's Ridley would be less likely to be affected because they are rarely in the park. These impacts would continue to be long-term, minor to moderate, and adverse.

Collisions between boats and sea turtles would be expected to be minimized in the slow speed and the noncombustion engine use zones.

The implementation of a marine reserve zone would result in less derelict fishing gear and commercial lobster trap gear (e.g., monofilament line and traps) in this area, which is known to cause strangulation, entrapment, and fatalities of sea turtles. This would result in the reduction of these threats to sea turtles within this zone. This would be a beneficial, long-term impact on sea turtles. This beneficial impact would be offset if fishing pressure increased outside the marine reserve zone.

Studies in Florida and other areas in the world have shown that artificial light adversely impacts sea turtle nesting. Light on Elliott Key is primarily generated from park service facilities, campground, and visitor harbor, all on the bay side of the island. This light does not reach the nesting beaches, which are on the ocean side of the island. Any light generated by campers in the group campsite, located on the ocean side of Elliott Key, would be minimal and unlikely to reach sea turtle nesting beaches. The proposed development in this alternative would not increase artificial light on the island. There would not be a substantial amount of light from the campsites. Mitigation measures such as education efforts regarding the importance of reducing artificial light, additional monitoring and patrols as visitation increases, and possibly limitations on the number of visitors would reduce the level of adverse impacts. The improvement of the existing trail and establishment of a primitive trail to University Dock on Elliott Key could increase the number of visitors that venture over to the beaches where the turtles tend to nest. This could require that the park change the management of this area to minimize disturbance to the turtles. Additional mitigation measures could also include increased visitor education and increased monitoring throughout the park and particularly in areas near where turtles nest. With mitigation, the impacts would be long term and adverse but negligible.

Section 7 Determination of Effect— Impacts to sea turtles from fishing and boating would persist in most of the park, resulting in a determination of "may affect, likely to adversely affect" for loggerhead, hawksbill, and green species that frequent the park waters.

American Crocodiles. Most visitor services and infrastructure in habitat suitable for crocodiles would remain near current levels with the designated paths, a viewing platform and boardwalk in the vicinity of Convoy Point. This area is north of the designated critical habitat area for the crocodiles and so would not be expected to impact their activities in the park. The mangrove south of the visitor center would continue to be managed primarily to protect the natural habitat characteristics of the area. The impacts of activities on crocodile habitat and activities along the mainland shore would be long-term, negligible and adverse.

The designated critical habitat includes the eastern shorelines of the keys southwest of the tip of Elliott Key to the park boundary. The critical habitat includes Porgy Key, which

would be zoned to provide visitor services as well as a base for some park administration activities. There are limited areas with suitable habitat on Porgy Key for crocodiles, so the impacts of any proposed development such as the proposed paddlecraft dock would be minimal and localized and slightly increase the development footprint in this area. Visitation in this area would be expected to increase because of the improved facilities and array of activities available on the key. These activities could include paddlecraft rental, which would allow visitors a nearby access point to the water zoned for noncombustion engine use around Old Rhodes and Totten Keys. There are dense mangrove areas along the eastern shores of both keys. The impact of increased visitation in this area on either habitat or individuals would be low. Although this area is within the designated critical habitat, few crocodiles have been seen in this area so impacts are expected to be adverse but negligible to minor.

If the population of crocodiles were to increase within the park, there could be increased interaction between visitors and crocodiles. The developed area at Adams Key provides an excellent opportunity to orient visitors to designated critical habitat for crocodiles, including appropriate actions when traveling in crocodile habitat. With mitigation, the long-term adverse impact of this alternative on the crocodile population in this area of the park would be negligible.

As a whole, the park protects habitat for the crocodile and serves to further its conservation through education and law enforcement, resulting in long-term beneficial impacts to this species.

Section 7 Determination of Effect— The long-term impacts on the American crocodile under alternative 3 would be both beneficial due to habitat protection and education as well as negligible and adverse in localized areas of critical habitat due to small developments. Mitigation measures would be put in place in the event of more human-crocodile interactions. Overall, this would equate to a "may affect, not likely to adversely affect" determination for the American crocodile.

Smalltooth Sawfish. In the waters of the multiuse zone (water), impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include potential for bycatch, which could occur with any continuation of hook-and-line fishing efforts as well as the potential for entanglement in marine debris such as fishing line and nets. These impacts would continue to be long term, minor to moderate and adverse, and long term, although realizing such effects is unlikely given the rarity of smalltooth sawfish in the park.

Construction of a boardwalk and platform in the mangroves in the Convoy Point area would affect a small amount of potential shallow water habitat. As in other alternatives, smalltooth sawfish could be affected by any increase in hook-and-line fishing efforts, although any effects are unlikely given the rarity of smalltooth sawfish in Biscayne National Park.

While the establishment of the marine reserve zone in deeper reef habitat is not likely to have a substantial effect on this species that tends to prefer shallow water, it is possible that the implementation of the no-fishing marine reserve zone could have a small yet positive benefit on smalltooth sawfish by reducing bycatch since reports of this species in reef and deeper water habitats, although uncommon, do exist. This locally reduced fishing pressure, where targeted fish species could grow larger and therefore increase in reproductive output, would result in a long-term beneficial impact on park fishery resources and effectively eliminate impacts to smalltooth sawfish from bycatch or entanglement in marine debris. Increased public outreach and/or law enforcement efforts would probably reduce the potential for illegal harvest of fish, including smalltooth sawfish. No other actions that would occur under this alternative would be expected to affect sawfish in the park.

Section 7 Determination of Effect— Existing impacts from fishing would persist in much of the park and may be locally reduced in some shallow water locations zoned for sensitive resources, noncombustion engine use, and slow speed. The section 7 effect determination would be "may affect, likely to adversely affect" for smalltooth sawfish under alternative 3.

Schaus Swallowtail Butterfly and Miami Blue Butterfly. New and expanded development on Adams Key where butterfly habitat exists would include a new staging area for paddlecraft, a dock, primitive campgrounds, improved trails, and possibly a general store. The majority of this development would be likely to be near shore so would have a limited impact on butterfly habitat. Development away from the water could be designed and located to minimize impacts on butterfly habitat. The impacts would be long term, negligible, and adverse.

Although visitation to most of Elliott Key is currently low, it is likely that visitation would increase once the trail that runs the length of the island is improved and a primitive connecting trail to University is complete. However, there is typically little interaction between visitors and these small butterflies. During installation and improvement of the trails, the area would be checked by a qualified biologist to ensure that no individuals or preferred host or nectar plants would be disturbed. Under this alternative and with any necessary mitigation, the impact on the butterfly population in the park would be long term, negligible, and adverse.

These impacts associated with park developments could be mitigated by timing trail work so that it does not coincide with butterfly breeding season, minimizing the number of trees that need to be removed during the hardening process, and minimizing changes in the drainage pattern on the island once the trail is completed. With these mitigation measures, the impacts would be long term, negligible, and adverse.

Management of Old Rhodes, Totten, and Swan Keys would be zoned to preserve natural resources with limited visitation, similar to the management currently in place under alternative 1. This would continue to have a beneficial impact on the butterfly populations on these keys. The greatest threat to the butterfly populations and habitat would remain weather-related phenomena and exotic invasive species.

Continued protection of butterfly habitat on these keys would generally be a beneficial impact to these butterfly species.

Section 7 Determination of Effect— The impacts on the Schaus swallowtail butterfly and the Miami blue butterfly would be both beneficial and long term, negligible and adverse in some locations, but mitigation measures to protect the species' habitat and breeding season are likely to be successful. Overall, the determination of effect for alternative 3 is "may affect, not likely to adversely affect" the Schaus swallowtail butterfly and the Miami blue butterfly.

Stony Corals. In the waters of the multiuse zone (water) impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include the potential for ecological and physical stress to corals from overfishing, fishing debris, anchoring, and/or vessel groundings associated with existing boating and fishing activities. Such impacts are long term, moderate, and adverse to stony corals and their habitat.

Legare Anchorage would be reduced in size, and in-water activities would continue to be restricted for in-water activities that would provide protection to corals in this area.

The creation of a 10,502-acre marine reserve zone would prohibit commercial and recreational fishing and anchoring on approximately 30% of the southern reefs within the park, which include areas known to have healthy populations of stony corals. Because visitors that would otherwise use the

area contained within the marine reserve zone to fish would have to fish elsewhere, boat traffic and anchoring throughout this zone could be expected to decrease. Some of these decreases would be offset by an anticipated increased use of the zone by snorkelers and scuba divers. Because the marine reserve zone is expected to reduce fishing and improve ecological balance, reduce fishing debris, reduce vessel groundings, and reduce damage from inappropriate anchoring in stony coral habitat, actions under alternative 3 would be expected to have a long-term, beneficial impact. While the nonextractive in-water activities of snorkelers and scuba divers would pose an increased risk of abrasion of corals and/or sedimentation from accidental touching, kicking, and stepping, these impacts could be mitigated by education and would be on a much smaller scale than the impacts of discarded and improperly used fishing gear currently occurring in the zone, and by the beneficial impacts of implementation of the marine reserve zone.

It is anticipated that commercial fishing would eventually be phased out parkwide as provided for in the *Fishery Management Plan* (2014); however, implementation of a marine reserve zone would prohibit all commercial fishing in this zone after passage of a park special regulation. This locally reduced fishing pressure, where targeted fish species could grow larger and therefore increase in reproductive output, would result in a long-term very beneficial impact on the stony coral habitat.

The addition of or relocation of mooring buoys and boundary markers would result in short-term, negligible to minor adverse impacts in specific areas associated with underwater installation and associated impacts to submerged substrates, although every effort would be made to install in locations away from corals, seagrass beds, and submerged cultural resources. Increased public outreach and/or law enforcement efforts would probably reduce the potential for illegal anchoring that could impact stony corals.

The use and maintenance of navigational markers and mooring buoys would continue to minimize impacts to stony corals from unintentional vessel and anchor damage.

Section 7 Determination of Effect— Existing boating, fishing, and marine debris impacts would persist in much of the park waters and continue to impact stony corals and their habitat. The marine reserve zone is expected to have a beneficial long-term effect on stony corals within that area by protecting them from activities that could lead to physical and ecological damage, thus reducing but not eliminating the adverse effects parkwide. Thus, this alternative would result in a determination of "may affect, likely to adversely affect" on stony corals.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be the similar to those described under alternative 1.

Alternative 3 would result in negligible adverse and beneficial impacts on federally listed species. When combined with the impacts of other past, present, and future actions, the overall cumulative effect would be negligible and beneficial. This alternative would contribute a small amount to the overall cumulative effects.

Conclusion. Existing impacts to listed species and their habitat would persist in much of the park. Some impacts would be reduced through changes in zoning which would be expected to have beneficial impacts, most notably sea turtles, stony corals and smalltooth sawfish in the marine reserve zone. In addition, this alternative would have a long-term, beneficial impact on manatees due to slow speed and noncombustion engine use zones. Taking action on this alternative to protect reefs from other pressures such as overfishing and physical damage from fishing gear, anchoring, and vessel groundings might also increase reef resiliency, potentially delaying the effects of global-scale stressors such as climate change, ocean acidification, and land-based sources of pollution (Jackson

2014). This is expected to result in beneficial impacts for stony corals and the listed species that depend upon reef habitats such as sea turtles.

Under this alternative there would be proposed minor development (a paddlecraft dock on Porgy Key, trail improvements on Elliott Key) that could have long-term, negligible, adverse impacts on American crocodiles, sea turtles, Schaus swallowtail butterflies and Miami blue butterflies. The park would continue to coordinate with the U.S. Fish and Wildlife Service and NOAA Fisheries and work to mitigate any adverse impacts on these species. Thus, the section 7 determination would be that this alternative "may affect, not likely to adversely affect" for those species.

Existing impacts to sea turtles, stony corals, and smalltooth sawfish would continue to be long term, moderate and adverse and would result in a "may affect, likely to adversely affect" determination although there are no new adverse impacts to these species associated with any proposed actions.

Cumulative effects would be negligible to beneficial. This alternative would contribute a small amount to the overall cumulative effects.

Special Status Species, including State Listed Species

Birds. Arsenicker and West Arsenicker Keys host wading bird colonies including state listed wading birds, state listed white-crowned pigeons, and West Arsenicker also hosts bald eagles. These keys would be zoned sensitive resource zones and would remain closed to visitors. Thus, there would be no effect on West Arsenicker bald eagle population, state listed wading birds or white-crowned pigeons or nesting activities for these species under this alternative.

Under this alternative, Soldier Key and the islands within Jones Lagoon would be zoned as nature observation zones. The waters of Jones Lagoon would be designated a noncombustion engine use zone. Visitation would be allowed on Soldier Key and the islands of Jones Lagoon, so there would be some human caused intrusions to birds nesting, roosting, loafing, and/or foraging there; however, resource protection would be emphasized. Actions under alternative 3 would reduce, although not eliminate, the potential for disturbance to birds using Soldier Key and the Jones Lagoon area because there is still the possibility that small nonmotorized vessels (e.g. , paddlecraft) and people coming ashore could closely approach birds. These disturbances could result in disruptions to natural nesting, roosting, loafing, or foraging behaviors of state listed birds. The establishment of a visitor services zone on Porgy Key could encourage visitation to the Jones Lagoon area, although the difficulty in accessing this area and the specialized equipment and knowledge needed to safely traverse Jones Lagoon would keep the likelihood of this fairly low. Given that visitation to both Soldier Key and Jones Lagoon would be expected to remain minimal, adverse impacts on the birds and their habitat would be minor. If visitation increases such that any state listed birds could be disturbed, management actions could include limiting access during nesting season to areas where birds are known to nest and/or establishing set-back distances following recommendations in scientific literature, since human disturbance has the potential for nesting birds to inadvertently crush their eggs while fleeing or to temporarily or permanently abandon their nests, thereby exposing the eggs to predators and extreme temperatures.

The proposed slow speed zone on the northern bay side of Elliott Key would be expected to reduce the likelihood of disruptions to birds using the coastal areas immediately adjacent to this zone. As a result, beneficial effects on state listed birds in the immediate area would be expected.

Overall, under this alternative, any necessary mitigation, would probably result in long-

term, minor, adverse impacts on state listed bird populations in the keys.

The proposed slow speed zone and the access-by-permit zone on the bay side of Elliott Key would be expected to reduce the likelihood of disruptions to birds using the coastal areas immediately adjacent to these zones. As a result, beneficial effects on state listed birds in the immediate area would be expected.

Under this alternative, birds using coastal habitats along the park's mainland shoreline would receive protection from potential boat-related disturbances from (1) the noncombustion engine use zone that extends 500 feet east from the mainland (excluding Black Point, Convoy Point, and Turkey Point Channels), and (2) a slow speed zone covering the area 500 to 1,000 feet from the shoreline. By reducing the usage of the waters immediately adjacent to the mainland shoreline, these two zones would be expected to reduce potential boat-related disturbances to birds that are roosting, nesting, foraging, and/or loafing along the mainland shoreline

Overall, this alternative, including any necessary mitigation would probably result in long-term, negligible, adverse due to the proposed development in this alternative. There would be beneficial impacts on state listed bird populations and nesting activity in the park due to the establishment of protective zones around the above mentioned keys.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. Alternative 3 would result in negligible impacts on listed birds due to increased visitor use and construction of minor visitor facilities. When combined with the impacts of other past, present, and future actions, the overall cumulative effect would be minor and adverse. This alternative would have a small contribution to the overall cumulative effects.

Conclusion. Under this alternative there would be proposed development that could result in long-term negligible adverse impacts on state listed species and would not be likely to lead to federal listing. There would be beneficial impacts to state listed birds through protective zoning which would reduce the likelihood of disturbance in important bird habitats caused by visitor activities.

Terrestrial Vegetation

Under this alternative, the adverse impacts on terrestrial vegetation on the keys, particularly the hardwood hammocks, would be greater than for alternative 1. Boca Chita, Elliott, Adams, and Porgy Keys would be managed for visitor access and recreation. Visitation to these keys would be concentrated in the developed areas. Impacts from increased visitation could include trampling of vegetation and social trails. In general, these impacts could be mitigated by visitor education efforts and trail design that would keep visitors on the existing trails. With mitigation measures in place, the adverse impacts of increased visitation on terrestrial vegetation would be long term, negligible to minor and adverse.

The proposed development on Boca Chita, Elliott, Adams, and Porgy Keys would be kept within areas that have been previously disturbed to the extent practicable. Access to the Jones homesite on Porgy Key would be managed to minimize impacts on sensitive resources. Some localized impacts could occur, but the adverse impacts on vegetation on the keys would be minimal. Any areas cleared during construction would be revegetated to minimize the long-term adverse impacts of the proposed development. The adverse impacts on vegetation on the islands from proposed development would be localized and negligible.

Under this alternative, the hiking trail on Elliott Key would be hardened from Petrel Point north to just past the University Dock, about 5 miles. Because the trail already exists,

the impacts on the vegetation would be minimal. Foliage removal on larger trees near the trail would be avoided to the extent possible. A primitive connecting trail would be built to University Dock. The trails would be constructed to minimize development of social trails, overall impact on vegetation, and changes in drainage that could occur because of trail improvement and establishment. With this mitigation, the impacts on vegetation would be long-term, adverse, and negligible. Some revegetation would occur as well.

Potential development of a food concession onshore at Elliott Key would have adverse impacts on vegetation. The impacts on vegetation would depend on the site chosen and the footprint associated with the development. The impact could be minimized by building on areas that have been previously disturbed or where minimal vegetation removal would be required. Because the exact location is not known, it is not possible to evaluate the impacts at this time. Before the development of a food concession on Elliott Key, additional environmental compliance would be conducted to determine the impacts on vegetation and other resources at Elliott Key.

Under this alternative, much of the mainland shoreline, Sands Key, and the islands surrounding Jones Lagoon would be zoned as nature observation zones and visitation would be allowed, however protection would be emphasized. This expected to have a long-term beneficial impact on terrestrial vegetation on these islands.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be the similar to those described under alternative 1.

When the negligible to minor adverse impacts of alternative 3 development and beneficial impacts of resource protection and education are combined with the impacts of other past, present, and future actions, the resulting cumulative impacts would be beneficial. This alternative would slightly reduce these beneficial cumulative impacts.

Conclusion. Implementing this alternative would result in long-term, negligible to minor, adverse impacts on terrestrial vegetation in localized areas associated with minor construction projects and continued or increasing visitor use. Adverse impacts would be less than alternative 2 due to the smaller footprint of trail improvements on Elliott Key.

Wetlands

Wetlands in the park would continue to serve as an important habitat area for a wide variety of terrestrial and aquatic species in the park. Placement of the nature observation zone along the mainland would give greater protection to mangrove shorelines. This would have long-term, beneficial impacts.

Under this alternative, a shoreline boardwalk would be developed through the mangrove forest to link the canals in the park. Construction of the boardwalk would cause both short-term and long-term impacts on the wetlands along the mainland shoreline. During construction there would be short-term adverse impacts on water quality from increased turbidity. Increased turbidity in the water column would temporarily degrade the habitat for aquatic species, which could also impact terrestrial species, particularly birds. These adverse impacts would be minor to moderate but localized. Long-term impacts would come from the removal of mangroves and other wetland plants and the shading of seagrasses, mangroves, and other vegetation from the boardwalk that could reduce the type and density of the mangroves near these developments. The localized adverse impacts would be long term and minor.

No additional access into the mangroves that fringe the keys would be developed under this alternative, so there would be no change in the current size, integrity or continuity of the wetland areas in the park. Mangroves are extremely difficult to walk through and so the

proposed visitor facility improvements at Porgy, Adams, Elliott, and Boca Chita Keys might attract more visitors but are not likely to affect the wetlands.

Cumulative Impacts. The actions proposed in the Biscayne Bay Coastal Wetlands Project could improve the overall health of wetland areas along the mainland shoreline such that the system as a whole is better able to accommodate the stresses associated with the short- and long-term impacts of the development and human use in the area.

Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. This alternative would contribute minor adverse impacts to the beneficial impacts of other present and future actions resulting in a beneficial cumulative impact. The contribution of this alternative to these cumulative impacts would be small.

Conclusion. Localized impacts associated with construction under this alternative would be short term, minor and adverse. The long-term impacts of the new facilities would be mitigated through design and would be adverse and minor. Cumulative impacts would be beneficial. The contribution of this alternative to these cumulative impacts would be small.

Submerged Aquatic Communities

In the waters of the multiuse zone impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include impacts on submerged aquatic communities caused by boating and fishing and associated marine debris. These impacts would continue to be long term, minor to moderate, and adverse.

Under this alternative, there would be greater controls on speed and vessel types in areas where there are submerged aquatic communities, particularly seagrass beds. The area from the mainland shoreline to 500 feet, the bay side of Elliott Key from Sands Cut to Elliott Key Harbor, and the waters within Jones Lagoon and around Totten Key to Cutter Bank Shallows would be zoned for noncombustion engine use only. The aquatic community nearest the mainland shore is seagrass, and the waters in Jones Lagoon to Totten Key and Cutter Bank Shallows have a combination of both the seagrass and hardbottom communities. Compared to alternative 1, the potential for adverse impacts on these communities would be reduced because there would be fewer boats in the area and boats would be moving relatively slowly. Losses in productivity in these areas would be less because of the reduced potential for scarring and turbidity. The long-term impacts on submerged aquatic communities in these areas would be beneficial.

The West, Middle, and East Featherbed Banks would be designated a slow speed zone, as would the area 500 feet to 1,000 feet adjacent to the noncombustion engine use zone along the mainland shoreline. The slow speed zone would reduce the potential for scarring the seagrass beds as well as increasing turbidity in the water column, thus minimizing adverse impacts on the productivity of this habitat and water quality in the area.

The waters around Porgy Key are exceedingly shallow and have abundant benthic life such as small corals, sponges, and marine plants. As a result of increased visitation to Porgy Key, impacts on this marine benthic community would be long term, minor, and adverse.

Under this alternative, a marine reserve zone would be designated from Hawk Channel east to the park boundary. The marine reserve zone would be managed to preserve natural resources with minimal human-caused intrusions. Boat size, type, and speed could be regulated to protect resources in this zone and fishing would be prohibited. It would be expected that the adverse impacts on the reef from boating and fishing activities would be reduced under this alternative. In particular, the potential for scarring from boat propellers or anchors would be reduced. The proposed

marine reserve zone (no-fishing area) is also expected to protect seagrass beds within zone boundaries, from the addition of mooring buoys. There could still be adverse impacts from other currently existing recreational activities such as scuba diving. As the site would likely attract more scuba divers, there could be an associated increase in diver-related impacts to reefs, primarily touching or breaking the reef (Barker and Roberts 2004; Hall 2001; Medio et al. 1997).

Implementation of the marine reserve zone would reduce the impacts of recreational activities in this area of the reef, and could potentially increase the resiliency of the reefs within this zone to external pressures such as marine debris, pollution, climate change, ocean acidification and coral bleaching (Mumby et al. 2013) resulting in a long-term, beneficial impact.

Long-term impacts from the proposed Convoy Point boardwalk would include the removal of mangroves and other wetland plants, trimming of mangroves, and have shading impacts on mangroves and other aquatic vegetation. Impacts would be long term, minor and adverse.

It is anticipated that commercial fishing would be phased out parkwide as provided for in the *Fishery Management Plan* (2014); however, implementation of a marine reserve zone would prohibit commercial and recreational fishing in this zone after passage of a park special regulation. This locally reduced fishing pressure, where targeted fish species could grow larger and therefore increase in reproductive output, would result in a long-term beneficial impact on submerged aquatic habitats.

The addition or relocation of mooring buoys and boundary markers would result in short-term, minor adverse impacts in specific areas associated with underwater installation and associated impacts to submerged substrates, although mooring buoys and boundary markers would be placed in locations away from corals, seagrass beds, and submerged cultural resources. Increased public outreach and/or law enforcement efforts would probably reduce the potential for illegal anchoring that could impact submerged aquatic communities and thus is a beneficial impact.

Overall, the health of the seagrass beds would be expected to increase under this alternative because of the increased areas zoned for slow speeds and noncombustion engines and the addition of a marine reserve zone.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar as those described under alternative 1.

Alternative 3 would result in long-term, beneficial impacts. When combined with the adverse impacts of other past, present, and future actions, the cumulative impacts would be minor to moderate and adverse. The contribution of this alternative to these cumulative impacts would be small.

Conclusion. Alternative 3 would result in long-term, minor to moderate adverse impacts to seagrass beds and corals in much of the park zoned for multiuse due to boating and fishing activities. However, in areas zoned for resource protection, including the marine reserve and access-by-permit zones, there would be beneficial impacts on submerged aquatic communities.

Soundscapes

In the waters of the multiuse zone impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include short-term, minor to moderate adverse impacts caused by boat noise on the water as well as short-term negligible adverse impacts caused by vehicles and routine maintenance equipment on land. In both cases, these noises can transcend the zone in which they originate and be heard in adjacent zones.

Natural soundscapes predominate in the distant portions of the park, away from popular boating routes. Increases in visitation on weekends and during special events add to the number of boats on the bay at one time. Increased boating from a generally increasing human population as provided in county and city plans would be expected to result in increased boat engine noise. Impacts associated with an increased number of boats in the park would be short term, minor to moderate, and adverse.

Under alternative 3, there would be areas of the bay zoned for slow speed or noncombustion engine use. There would also be two access-by-permit zones that would reduce the number of boats at one time in these zones. Because these restrictions would reduce the level and duration of noise from boats, there would be long-term, beneficial impacts on soundscapes on portions of the bay and adjacent land.

There would a limited amount of new construction in this alternative occurring mostly in the visitor service and park administration zone. The new construction called for in this alternative would result in short-term, localized, adverse impacts that would be negligible in intensity. Long-term impacts from use of new development such as trails and boat launches would be adverse but negligible.

Existing natural soundscapes in the interior of the larger keys would continue to be preserved by protective zoning and relatively low visitor use—a continuing beneficial impact.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar as those described under alternative 1. The beneficial and adverse impacts of this alternative, in combination with the adverse impacts of other actions, would result in minor and adverse cumulative impacts on the natural soundscape; however, the contribution of this alternative to these impacts would be a slight reduction of these adverse cumulative impacts.

Conclusion. Implementing alternative 3 would have long-term beneficial impacts on soundscapes due to protective zoning. Short-term negligible to minor, adverse impacts during construction and existing minor to moderate adverse impacts on natural soundscapes would continue as a result of persistent boat-related noise in much of the park. Existing negligible, short-term adverse impacts on natural soundscapes would continue as a result of routine park operations and maintenance activities.

CULTURAL RESOURCES

Archeological Resources (including submerged archeological)

Implementation of this alternative would have the similar impacts on archeological resources as those listed in alternative 1. The strong emphasis on cultural resource protection could be expected to have some additional beneficial impacts on archeological resources (including submerged archeological) sites. Actions under this alternative, such as exclusion of visitors from West Arsenicker, Arsenicker, and Swan Keys, would generally contribute to beneficial impacts on potential and known terrestrial and submerged archeological sites. These added protections would provide far less potential for treasure hunting, looting, amateur collection, and inadvertent visitor impacts.

Under alternative 3 archeological resources could be adversely impacted by the following specific actions on keys selected as principal visitor destination points:

- expanded recreational development for day use and camping and adaptive use of Boca Chita Key Historic District
- development and upgrading of new and existing trails, establishment of primitive campsites, and installation of

composting toilets and visitor kiosks on Elliott Key

- improved visitor services and facilities and development of a small commercial visitor services facility and staging area for paddlecraft on Adams Key
- construction of a dock to facilitate vessel access on Porgy Key

All ground-disturbing activities would be preceded by site-specific archeological surveys and, where appropriate, subsurface testing to determine the existence of archeological resources and how best to preserve them. Known archeological resources would be avoided to the greatest extent possible. Few adverse impacts on archeological resources from construction would be anticipated, but any adverse impacts would be permanent and minor in intensity.

Although ongoing and expanded archeological site monitoring programs would be initiated and efforts would be undertaken to minimize or mitigate potential impacts from human activities, increased recreational use and access to areas of the park could result in the disturbance of archeological resources because of inadvertent visitor impacts or vandalism. A loss of surface archeological materials, alteration of artifact distribution, and a reduction of contextual evidence could result. Continued ranger patrol and emphasis on educating the general public and scuba diving community regarding the significance and fragility of archeological resources would discourage illicit activities and inadvertent impacts and help minimize adverse impacts. Adverse impacts would primarily be minor and permanent.

Although stabilization/interpretation of the Jones homesite historic ruins on Porgy Key would enhance protection of those archeological resources as a beneficial impact, more visitors would be drawn to the area, thus increasing the possibility of disturbance, degradation, or loss of resources as a result of inadvertent human activities or vandalism at a site that was formerly protected by its isolation and relative inaccessibility. The latter would be a long-term, minor, adverse impact.

Provision for a wide variety of expanded recreational activities on most of the park's water acreage, Elliott Key (not including the visitor services / park administration zone), and the mainland between Convoy Point and Black Point Park could result in disturbance, degradation, or loss of resources associated with the Offshore Reefs Archeological District as well as other submerged archeological and terrestrial archeological resources scattered throughout the park.

Archeological (and submerged archeological) resource protection would be a high priority in the nature observation zone and access-by-permit zone that would be managed to limit intensive visitor use. Under this alternative, this includes three mainland areas and Ragged, Sands, Rubicon, Reid, Old Rhodes, Totten, Gold, East Arsenicker, Long Arsenicker, and Mangrove Keys and an access-by-permit area west of Elliott Key. Nevertheless, self-directed visitor activities designed to immerse visitors in relatively remote surroundings would potentially subject known and unknown archeological (terrestrial and submerged) resources in the park to disturbance as a result of inadvertent human activities or vandalism because visitors would be drawn to areas that were formerly closed to visitors or protected by their relative isolation.

Reduction of Legare Anchorage to about 1 square mile would continue to afford protection to sensitive underwater archeological resources in the Offshore Reefs Archeological District. Better navigational markings and more logical coordinate-based designation of the protected zone might result in improved public compliance with the regulations in Legare Anchorage, and closure of Legare Anchorage to commercial trapping would reduce resource damage from snagged gear. These steps could be expected to provide additional protection that would

result in a long-term and localized beneficial impact on archeological resources.

Potential archeological resources on West Arsenicker and Arsenicker Keys and in the water extending out 500 feet from them and on Soldier and Swan Keys would continue to be protected by keeping them closed to visitors and only permitting research under a permit. This continued protection would provide a long-term and localized beneficial impact on archeological resources.

Under this alternative, a marine reserve zone would be designated from Hawk Channel east to the park boundary. The marine reserve zone would prohibit recreational and commercial fishing and phase out anchoring on many of the southern reefs in the park, which includes potential maritime and cultural landscape areas. This prohibition of fishing would virtually eliminate the on-site generation of fishing-related marine debris and its associated impacts on submerged cultural resources, which would be a long-term beneficial impact. The potentially increased scuba diving-related activities associated with a healthy and attractive coral reef system could have negligible to minor adverse impacts on submerged cultural resources due to depreciative visitor behaviors and accidental damage. Impacts from fishing and anchoring would continue outside the marine reserve zone.

Also, although this alternative increases the potential impact on submerged archeological resources from visitor access threats, the establishment of a marine reserve zone can be expected to lessen the impact damage associated with anchoring and commercial fishing and trapping activities on archeological sites. Adverse impacts associated with increased visitor access would be minor and permanent; beneficial impacts associated with the establishment of the marine reserve would also be permanent.

The addition of or relocation of mooring buoys and boundary markers would result in long-term beneficial impacts to submerged cultural resources, as they would provide protection to sites from the threat of anchor damage. With increased public outreach and/or law enforcement efforts reducing the potential for illegal anchoring, these long-term benefits would be enhanced. The installation of mooring buoys in conjunction with no anchoring zones would also result in long-term beneficial impacts to submerged cultural resources sensitive to visitation pressure, by providing a means of controlling visitor carrying capacity at the sites.

Cumulative Impacts. Impacts associated with other past, present and reasonably foreseeable actions would be similar as those described under alternative 1. As described above, implementation of alternative 3 would result in permanent, negligible to minor, adverse impacts and beneficial impacts. The impacts of alternative 3, in combination with both the long-term, negligible to minor adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a permanent, minor, adverse cumulative impact. The adverse impacts of alternative 3, however, would be a small component of the adverse cumulative impact.

Conclusion. Implementation of this alternative would have beneficial impacts on archeological resources because of the potential for reduced anchor damage and decreased visitation pressures on some submerged archeological resources. Some minor potential adverse impacts by the alternative's provision for expanded recreational use and enhanced visitor services, facilities, and access to some areas of the park could be realized. Actions under this alternative would have a cumulative beneficial impact on archeological resources.

Section 106 Summary. The implementation of this alternative could include some minor adverse impacts on archeological resources. If impacts remain minor there would be no adverse effects under section 106. Any adverse impacts resulting from moderate or major impacts would be mitigated through the use of

The Secretary of the Interior's Standards and Guidelines for the Treatment of Historic Properties and a memorandum of agreement with the state historic preservation officer and Advisory Council to counteract such adverse effects.

Historic Structures and Buildings

Implementation of alternative 3 would have similar impacts on historic structures and buildings in the Boca Chita Key Historic District and at Fowey Rocks Lighthouse as those listed under alternative 1 because they would be rehabilitated, preserved, and adaptively used in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. However, some minor elements of historic fabric could be lost as a result of remodeling/ rehabilitation efforts and anticipated increasing visitation levels. These adverse impacts could result in a negligible to minor, short-term, impact from inadvertent visitor use or vandalism. However, as with alternative 1, impacts on historic structures and buildings would be primarily localized, long-term to permanent, and mostly beneficial.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. As described above, implementation of alternative 3 would result in negligible to minor adverse impacts and beneficial impacts. The impacts of alternative 3, in combination with negligible to minor adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a negligible to minor cumulative impact. The adverse impacts of alternative 3, however, would be a small component of the adverse cumulative impact.

Conclusion. Implementation of this alternative would have similar impacts on historic structures and buildings in the Boca Chita Key Historic District as those listed under alternative 1 because they would be rehabilitated, preserved, and interpreted by the National Park Service in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. As with alternative 1, impacts on historic structures and buildings would be localized, long-term to permanent, and generally beneficial. Actions under this alternative would have similar cumulative impacts on historic structures and buildings in the park as those listed under alternative 1. Implementation of this alternative would have cumulative beneficial impacts.

Section 106 Summary. The implementation of this alternative could include some minor adverse impacts on historic buildings and structures. If impacts remain minor there would be no adverse effects under section 106. Any adverse impacts resulting from moderate or major impacts would be mitigated through the use of *The Secretary of the Interior's Standards and Guidelines for the Treatment of Historic Properties* and a memorandum of agreement with the state historic preservation officer and Advisory Council to counteract such adverse effects.

Cultural Landscapes

Implementation of this alternative would have similar impacts on cultural landscapes in the park as those listed under alternative 1 because potential landscapes would continue to be surveyed, inventoried, and evaluated under National Register of Historic Places criteria, and the National Park Service would implement resource management policies that preserve the natural resource values and culturally significant character-defining patterns and features of Boca Chita Key as well as other listed, or determined eligible, landscapes in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties With Guidelines for the Treatment of Cultural Landscapes*.

Enhancement of Boca Chita Key as a visitor destination point and park administration center could result in some loss to the

integrity of the key's cultural landscape, which would be a negligible to minor, long-term, adverse impact. Additionally, some minor elements of the historic scene in the Boca Chita Key Historic District could be impacted by rehabilitation and adaptive use of the historic structures for purposes that are inconsistent with historic use of the area, new facility construction that is incompatible with the district's historic structures, and anticipated increasing levels of visitation, which would also be long term, negligible to minor, and adverse.

Enhancement of recreational opportunities to attract increasing numbers of visitors to Elliott Key through development and upgrading of new and existing trails, establishment of primitive campsites, and installation of composting toilets and visitor kiosks could have some long-term, minor adverse impacts on the Sweeting Homestead's potential cultural landscape.

Minor elements of the potential cultural landscape at the Jones homesite historic ruins on Porgy Key could be compromised because interpretation of and hardened trail access to the ruins would draw growing numbers of visitors to a remote site that has been largely inaccessible. These impacts would likely be short term to long term, minor, and adverse. However, restoration activities at the Jones homesite would have localized, long-term beneficial impacts as well. Construction of a dock on Porgy Key could have short-term to long-term minor adverse impacts on the potential cultural landscape's historic scene.

Although enhancement of recreational opportunities and visitor facilities throughout much of the park's lands and waters could result in some additional long-term, minor, adverse impacts on the integrity of the potential parkwide maritime cultural landscape. Actions under this alternative, such as the creation of the marine reserve zone would generally contribute to beneficial impacts to a potential marine cultural landscape.

Cumulative Impacts. Impacts associated with other past, present and reasonably foreseeable actions are similar to those described under alternative 1. As described above, implementation of alternative 3 would result in negligible to minor adverse impacts and beneficial impacts. The impacts of alternative 3, in combination with minor adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a minor cumulative impact. The adverse impacts of alternative 3, however, would be a small component of the adverse cumulative impact.

Conclusion. Implementation of this alternative would have similar beneficial impacts on cultural landscapes as those listed under alternative 1. Expanded recreational use, enhanced visitor services, facilities, and access, and increased development in some areas of the park could have some long-term negligible to minor impacts on the integrity of the park's potential cultural landscapes.

Section 106 Summary. Implementation of this alternative could include some minor adverse impacts on cultural landscapes. If impacts remain minor there would be no adverse effects under section 106. Any adverse impacts resulting from moderate or major impacts would be mitigated through the use of *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes* and a memorandum of agreement with the state historic preservation officer and Advisory Council on Historic Properties to counteract such adverse effects.

VISITOR EXPERIENCE

Diversity of Visitor Activities

Under this alternative, visitors would continue to have unrestricted access (as described in the multiuse zone [water]) to most of the park's waters to participate in a wide range of recreational opportunities such as

motorboating, sailing, paddling, swimming, scuba diving, snorkeling, fishing, and nature study. About 16% of the park's waters would have some restrictions or changes (existing and new) that would potentially enhance, modify, limit, or prohibit visitor access and activities.

This alternative would require visitors to maintain slow speeds along the mainland shore and at Sands Cut. Slow speed zones would also be added to Caesar Creek and West, Middle, and East Featherbed Banks on either side of the Intracoastal Waterway west of Boca Chita Key. These zones would help focus visitor attention to these relatively shallow and sensitive areas of the bay. slow speed zones would be applied over the West, Middle, and East Featherbed Banks and would reduce the frequency of boat groundings, which would be a long-term beneficial impact on some visitors. A slow speed zone on Caesar Creek would protect resources and reduce damage to vessels at Adams Key dock. Some visitors would have boats with too deep a draft to be able to operate successfully at slow speeds in these areas and would be excluded from access. For these visitors, this change would be perceived as a long-term adverse impact on their visitor experience while boating in the park. The total area with slow speed restrictions would be about 1.5% of park waters.

The noncombustion engine use zone would include two areas—waters within 500 feet of the mainland and the Cutter Bank and Jones Lagoon area, including Rubicon Keys. This zone would have impacts that are similar to impacts of the slow speed zone but would require boaters to pole or use an electric trolling motor. Some visitors would have boats with too deep a draft to be able to operate successfully at the slower speeds required from using a noncombustion engine and would be excluded from these areas. For some visitors this change would be perceived as a long-term adverse impact on their visitor experience while boating in the park. Other visitors would benefit over the long term because the resulting decrease in noise, speeds, and number of motorboats would enhance visitor safety and opportunities to quietly explore the mangroves and lagoons by paddlecraft, observe wildlife, experience the natural sounds of the marine environment, and find solitude. Also, boaters would have less likelihood of grounding in this zone, and flats anglers would have improved conditions for successful catches—a long-term beneficial impact. This noncombustion engine use zone would affect about 2% of park waters.

Under this alternative, Legare Anchorage would be reduced in size relative to current conditions. This would result in visitors having access to an additional 1,700 acres of reef waters for a full range of recreational activities (multiuse zone). The sensitive underwater archeological zone, which would be applied to a smaller area (than alternative 1) of Legare Anchorage, would allow limited visitor access, which is currently the case. The addition of 1,700 acres to the multiuse zone would provide visitors enhanced opportunities for access and recreation, which would be a long-term beneficial impact on visitor's ability to access and recreate in park waters.

The access-by-permit zone would affect about 3% of park waters. Included in this zone would be a large area of bay waters in the northwest quadrant of the park and bay waters along Sandwich Cove of Elliott Key. Visitors currently have unlimited access to these areas. Adding this permitting requirement would be perceived by some visitors who have previously used these areas of the park without restriction as a negative impact on their visitor experience. However, for other visitors this access-by-permit opportunity would likely become increasingly valuable as park visitation levels increase because it would allow visitors to have a relatively secluded or at least uncrowded visit of certain areas of the park with limited competing noise or activity from other groups. This would be a long-term beneficial impact on visitor access and opportunities for a range of visitor activities.

The continued closure to visitors of West Arsenicker and Arsenicker Keys would not change. What would change under this alternative is the application of the sensitive resource zone 500 feet out from the keys' shorelines. This would be a slight increase over the current 200-foot closure. Also, Swan Key would be closed to visitors. This area is currently lightly used; however, those visitors who are used to having unrestricted access might find this closure to be a long-term, minor, adverse impact on their access throughout the park.

The northern and southern sections of the mainland, most of the southern keys and all of Sands Key, would be in the nature observation zone. The relative inaccessibility of the mangrove forests and tropical hardwood hammocks naturally limits the range of visitor activities. Most visitors to these areas would likely experience few interactions with others and would have opportunities to explore, observe nature, and find solitude. This in general would result in little change over current visitor experience conditions.

The marine reserve zone in this alternative sets aside a small portion of the park's waters from consumptive activities. It is intended to offer visitors unparalleled recreational experiences, including the opportunity to experience an intact, unfished coral reef. Marine scientists throughout the world have found that marine reserve zones afford protection that allows reef ecosystems to recover from consumptive activities and related debris. Heightened protection could provide and sustain the type of visitor experience for which the park was established. With proper protection, Biscayne's signature feature, its coral reef, could become one of South Florida's premier tourist destinations for divers, snorkelers and marine enthusiasts.

An area from Hawk Channel to the eastern park boundary (about 6% of park waters) would be placed in the marine reserve zone. Visitors would continue to be able to engage in a range of recreational activities except fishing or harvesting of living organisms. Management priorities for this zone would be to maintain a more intact and healthy reef ecosystem. This would likely result in more and bigger fish and would contribute positively to visitors' abilities to experience the natural sights of the reef. Visitors no longer able to fish in this area would experience a long-term, minor to moderate adverse impact. This impact could be mitigated by the anticipated spillover impacts from the marine reserve zone to adjacent multiuse zones (water) where fishers could expect to catch more and bigger fish.

Visitors who snorkel and dive in the marine reserve zone would be able to experience a healthier, more natural coral reef than what is currently present, with larger and more numerous tropical reef fish and an ecologically intact reef system. The increased number of mooring buoys would make the snorkeling and scuba diving experience safer and easier. Therefore, a beneficial impact would be expected for visitors who snorkel and dive in the marine reserve zone.

Although anchoring would not be allowed in the marine reserve zone, additional mooring buoys would be provided to facilitate access to reefs and historic shipwrecks within this zone according to the Mooring Buoy and Marker Plan.

Visitor Services and Facilities

The addition of a viewing platform, mangrove boardwalk, and catwalks at Convoy Point would substantially increase visitors' opportunities to walk, fish from shore, see the scenery, and explore and learn about mangrove habitat. This would enhance the range and quality of recreational and interpretive opportunities available in the Convoy Point area and potentially extend the length of a person's visit. These facilities would be long-term beneficial enhancements to the visitor experience, especially for visitors who do not have the time, ability, or means to visit outlying park resources.

Both Porgy Key and Adams Key would be zoned for visitor services. Providing a concessioner transport service to either island with opportunities for commercial paddlecraft rentals would substantially enhance opportunities for visitors to safely access and explore the adjacent noncombustion engine use zone in and around Jones Lagoon and the southern keys. These services and facilities, along with other enhancements such as dock improvements, improved trails, cultural resource stabilization and interpretation, primitive camping facilities, and potentially a general store at Adams Key, would have long-term beneficial impacts on expanding recreational opportunities in the southern sector of the park and enhancing opportunities for education, solitude, and nature observation. Although it is anticipated that this type of service would increase the number of encounters between visitors, the size and character of this area of the park would enable easy dispersal and separation of groups most of the time.

The improvement of existing trail and establishment of a primitive connecting trail to University Dock in Elliott Key would improve the accessibility of most of the island to visitors. Enhanced access to the more remote cove areas would offer additional opportunities for visitors to experience a more rugged, backcountry, maritime environment. Provision of visitor services such as toilets, kiosks, and a possible food concession, as well as the amenities above, would in general make Elliott Key much more attractive as a destination within the park. Visitation would likely increase, and there would be an increased frequency of visitor encounters. In general, these changes would have long-term beneficial impacts on the visitor experience. However, some visitors who are attracted to the island for the purposes of solitude and nature study would potentially be adversely impacted over the long term by the additional activity and visitor levels, especially during peak use times.

All of Boca Chita Key would be included in the visitor services / park administration zone. Reuse of historic structures in lieu of new construction would be a positive impact on the visitor experience because it would maintain the historic integrity and ambiance of the cultural landscape and opportunities for visitors to learn about and understand the key's past use. Given the popularity of Boca Chita Key, increasing visitor services on this key would be a long-term beneficial impact on use.

Construction activities associated with facility upgrades discussed above would result in short-term, minor, adverse impacts on visitors trying to access and use these areas.

In this alternative, visitors, especially those with their own boats who normally would not visit Convoy Point, would have substantially increased opportunities to access information about the park before entering. The placement or enhancement of nine visitor information points at locations outside the park would help visitors learn about the park and any regulations or necessary permits, and would help visitors plan their visit in advance; thus they could use their time more efficiently and potentially have a more enjoyable visit.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. The actions under this alternative, especially park zoning that could enhance resource conditions, such as the slow speed, noncombustion engine use, sensitive resource, and nature observation zones, combine with ongoing regional efforts, would have the potential to improve the quality of visitor activities in the region, especially related to fishing, nature viewing, and other resource-based recreational activities. There would also be improved visitor opportunities to learn from various sources regarding the importance and complexity of restoration efforts in a rapidly growing urban environment.

The fishing prohibitions in the marine reserve zone, combined with similar prohibitions and/or restrictions in waters outside of the park boundary, could increase crowding in reefs still open to fishing. This could be a long-term, moderate adverse impact to visitor experience of those fishers.

When combined with the beneficial impacts of other actions, the actions proposed in alternative 3 would result in a beneficial cumulative impact on visitor experience in the area. Alternative 3's contribution to these cumulative impacts would be small.

Conclusion. Additional speed restrictions, new noncombustion engine use and access-by-permit zones would potentially exclude some visitors from these areas, which would be a long-term, minor to moderate, adverse impact. The same zones would help over time to separate conflicting visitor uses; increase boating safety; and increase recreational opportunities like paddling, wildlife viewing, and solitude. These would be long-term beneficial impacts on some visitor experiences. Both long-term, minor, adverse and beneficial impacts would occur to different visitors from implementing the marine reserve zone. Overall, there would be long-term beneficial impacts on most visitors' experiences. The cumulative impact would be beneficial. Alternative 3's contribution to these cumulative impacts would be small.

NPS OPERATIONS AND FACILITIES

Actions under alternative 3, with its emphasis on providing a balance between unrestricted recreational access and enhanced resource protection in the park, would have similar impacts on park operations and facilities as those described for alternative 2. Under alternative 3, however, more personnel would be required to enforce park regulations, educate visitors about, and monitor the marine reserve zone and expanded slow speed and nature observation zones. The access-by-permit zone would be managed and enforced by a labor-intensive permitting and patrolling system. Thus, this alternative, which would also include establishment of up to nine potential visitor contact points outside the park would result in additional long-term, minor, adverse impacts on the park's budget.

Cumulative Impacts. As discussed under alternative 1, past and ongoing cooperative planning and development projects in the Biscayne Bay region, such as the Biscayne Bay Partnership Initiative, the Miami-Dade County Comprehensive Development Master Plan, and the Biscayne Bay Strategic Access Plan, and NPS special resource studies, such as those for Miami Circle and Virginia Key Beach Park, have resulted in some long-term beneficial impacts on park operations and facilities. However, these impacts are almost impossible to measure.

This alternative, with its emphasis on providing a balance between unrestricted recreational access and enhanced resource protection in the park as well as establishment of potential visitor contact points outside the park, in combination with the aforementioned beneficial impacts of past and ongoing cooperative planning and development projects in the Biscayne Bay region, would generally result in long-term, beneficial cumulative impacts on facilities and long-term, negligible, adverse cumulative impacts on park operations; this alternative's contribution to these impacts would be small and beneficial for facilities and small and adverse for park operations.

Conclusion. Overall, actions under alternative 3 would result in short-term and long-term, minor to moderate, adverse impacts on the park's budget for park operations and facilities. The overall cumulative impacts would be long term and beneficial for facilities and long term, negligible, and adverse for park operations due to new zones and increased law enforcement demands for marine reserve zone; this alternative's contribution to these impacts would be small and beneficial for facilities and small and adverse for park operations.

SOCIOECONOMIC ENVIRONMENT

Full implementation of this alternative would require 19 additional full-time equivalent staff positions to handle the increased workload for interpretation, cultural resource management, natural resource management, law enforcement, administrative support, and maintenance. Actual staffing levels would reflect the availability of adequate budgets. Any additional employment along with federal dollars that would be required to implement this alternative is expected to have a long-term beneficial impact on the regional economy.

Under this alternative, visitors would continue to have unrestricted access (multiuse zone) to most of the park's waters (approximately 82%) and would be able to engage in a wide range of recreational activities. Adverse impacts now occurring on fishery resources and habitat in the park would be reduced under this alternative due to the additions of slow speed, noncombustion engine use, sensitive resource, access-by-permit, and nature observation zones. It has been estimated that Biscayne Bay related recreational activities created $3.8 billion in economic output, $2.1 billion in incomes, and 57,000 jobs (Hazen and Sawyer 2005). However, there are indications that Biscayne Bay is showing a decreased capacity, or resilience, to withstand external pressures that may affect the bay's long-term health, and its environmental and economic sustainability (Adams and Blair 2014). These zones would help over time to separate conflicting visitor uses, increase boating safety, and increase nonmotorized recreational opportunities. Economic studies beginning with Fisher and Krutilla (1972); Cichetti and Smith (1973, 1976); Prince and Ahmed (1988) have shown that congestion will cause recreationist to adjust their length of visit and satisfaction with their recreation experiences. The expected long-term beneficial impacts on park fishery resources and habitat as well as on some visitor experiences associated with the implementation of these zones would result in a long-term beneficial impact on the sustainability of local tourism and resource-based economic activities. The proposed visitor services, facilities improvements, and zoning would enhance the range and quality of recreational and interpretive opportunities available throughout the park, which has the potential to improve visitors' park experience and satisfaction and possibly increase the number of visitors and average length of park visit.

Similar to the no-action alternative, the continued presence of Biscayne National Park positively contributes to the value of surrounding private land.

Economic Effects of Marine Reserve Zones

Implementing alternative 3 would result in the creation of a marine reserve zone, which is a no-fishing area. The zone in this alternative would encompass about 6% of the park waters.

There are many marine protected areas around the world, with varying levels of protection for marine habitats and different restrictions on fishing and recreation. Some areas limit fishing entirely (termed "no-fishing" areas or marine reserves) while allowing recreational use such as boating and scuba diving. Other areas have limitations on fishing by factors such as species, type of gear used, season, or location. Few comprehensive studies have followed the economic effects of marine protected areas because of the associated complex socioeconomic conditions. This, and the variety of protected area designations, makes comparison of economic effects difficult, but some generalizations can be drawn from some of the larger studies that have been performed.

In the Philippines, a portion of the Sumilon Island, Cebu, was closed to all fishing for 10 years, while swimming and scuba diving were allowed. After that period, fish abundance had increased three-fold, with the most significant increases among the most highly targeted species (White et al. 2002). Additionally, the

yearly fish catch to fishers on the same reef but outside the sanctuary more than doubled, from 14 tons per square kilometer to 36 tons per square kilometer (Russ and Alcala 1996; cited in White et al. 2002). Food security, increased income from tourism, and pride in their protection role were also cited as major benefits of this sanctuary (White et al. 2002).

Leeworthy and Wiley (2003) investigated both qualitative and quantitative effects of the six "no-take" alternatives that were developed for the Channel Islands National Marine Sanctuary. In the context of the entire diverse economy of the study area, which included San Diego, Los Angeles, and Orange Counties, the authors concluded there would be no significant macroeconomic or fiscal effects from the marine reserves. However, they noted that local economies may be impacted, and that there may be significant effects on certain individuals or groups. In the short term, negative effects or costs may impact the commercial fishing industry and the recreational fishing community because of displacement and loss of income, including secondary losses to associated industries. In the long term, however, these groups may realize benefits because the improved health of fishery resources in the marine reserve would lead to improved fish stocks outside the reserve. The authors found that recreational users who engage in scuba diving, sailing, sightseeing, and wildlife viewing would realize benefits from marine reserves, as would the service providers supporting these activities. The authors note that human response—both from the commercial and recreational fishing sectors and by recreational and passive users—is highly adaptive, and that financial losses are not always realized if these groups adapt quickly to the reserve zones (Leeworthy and Wiley 2003).

Although the establishment of a marine reserve zone could result in some short-term, negligible and adverse impacts on local businesses that formerly took visitors out to fish in the marine reserve zone, the expected spillover effect, where fish species could grow larger and therefore increase in reproductive output, would generally contribute to long-term, beneficial impacts on recreational fishing and associated service-related sectors.

Limited commercial fishing currently takes place in the proposed marine reserve zone. Parkwide phase-out of commercial fishing is addressed in the separate and previously described *Fishery Management Plan*. However, the establishment of a marine reserve zone would terminate commercial fishing in this area of the park immediately, after passage of a park special regulation. This would have a localized, negligible adverse impact on commercial fishing as this activity would have to occur elsewhere in or out of the park.

Nonconsumptive recreation benefits currently taking place in the area, such as snorkeling and scuba diving, would continue in the proposed marine reserve zone. Economic studies have shown that snorkelers and scuba divers would increase trips with improvements in fish abundance, water visibility, and coral quality (Bhat 2003), all of which are expected to occur under this alternative. An increase in recreational scuba diving may increase coral reef damage due to a higher frequency of diver-coral contacts (Chadwick-Furman 1997; Krieger and Chadwick 2012). This would be mitigated through an increased ecotourism management strategy to specifically educate divers about the extra care needed when recreating around coral reefs. Therefore, a long-term beneficial impact would be expected for snorkeling- and scuba diving-related businesses.

The number of visitors and average length of visit would be expected to increase because of the additional experience opportunities and associated proposed visitor services and facilities improvements in the park. Local businesses that rely on the tourist trade would receive a long-term, minor benefit. For example, every 1% increase in annual visitation would mean an increase of about $164,000 to the local economy through direct and indirect visitor spending each year.

Actions under this alternative are anticipated to provide park coral reefs the greatest opportunity for reef ecosystem recovery and increased reef resiliency. Johns et al. (2003) report that reef-related expenditures in Miami-Dade County generate $614 million in income and sustain 19,000 jobs in Miami-Dade County and generate nearly $4 billion dollars in sales in the southeast Florida region annually. The establishment of a marine reserve zone has the potential to help sustain the current contributions southeast Florida coral reefs provide to the regional socioeconomic environment.

Cumulative Impacts. Impacts associated with past and ongoing partnership and planning efforts, presence of nearby recreational opportunities and expanded developed area according to city and county plan with its associated population and park visitation increase would be similar to those described under alternative 1. The proposed actions of this alternative to improve access and recreational opportunities and facilities, as well as the satellite visitor information sites, combined with similar regional efforts, would have a beneficial contribution to the impacts of more and better public information about, and access to, the Biscayne Bay area and enhanced opportunities to learn about and recreate there.

The expected improvement in quality of visitor activities especially related to fishing, nature viewing, and other resource-based recreational activities resulting from zoning changes proposed in this alternative such as slow speed, noncombustion engine use, sensitive resource, and nature observation zones, combine with ongoing regional efforts, would have the potential to improve the regional socioeconomic environment—a long-term beneficial impact.

The long-term socioeconomic impacts of phasing out commercial fishing in the park are expected to be realized with the anticipated implementation of the *Fishery Management Plan* and are assessed in that plan. For more information on the *Fishery Management Plan*, please visit http://www.nps.gov/bisc /parkmgmt/fishery-management-plan.htm.

Alternative 3 would contribute a small increment to the above impacts of other past, present, and future actions on socioeconomic conditions and, when considered in combination with other actions, would result in a beneficial cumulative impact.

Conclusion. The strong protection of natural and cultural resources that is expected to enhance resource conditions would have a long-term beneficial impact to the regional socioeconomic environment. Upgrades in park visitor services and facilities would support regional efforts to enhance tourism and increase visitor access and recreational opportunities in the area.

There would be long-term, localized, negligible, adverse impacts to commercial fishing due to the establishment of a marine reserve zone. There would be long-term beneficial impacts would occur to for snorkeling- and scuba diving-related businesses from the continuation of nonconsumptive recreation uses in the marine reserve zone. The expected spillover effect, where fish species could grow larger and therefore increase in reproductive output, would generally contribute to long-term, beneficial impacts on recreational fishing and associated service-related sectors.

The overall cumulative effects would be beneficial with this alternative contributing a small increment.

UNAVOIDABLE MODERATE OR MAJOR ADVERSE IMPACTS

Unavoidable adverse impacts are defined here as impacts that cannot be fully mitigated or avoided. There would be no unavoidable moderate or major adverse impacts expected as a result of implementing alternative 3.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Alternative 3 would have a relatively high potential for some commitments of resources when compared to other alternatives because it would involve new development (e.g., trails, dock, and buildings). However, most of the development being proposed, such as trails and small facilities, would have only small areas of potential impact. Most proposed developments would be built in previously disturbed areas and would not result in substantial irreversible or irretrievable commitments of resources. Cultural resources would continue to be protected through active preservation maintenance.

NATURAL OR DEPLETABLE RESOURCES AND ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

Whenever feasible, the National Park Service strives to maximize the use of renewable resources and energy and therefore minimize the use of depletable resources. However, it is not possible with today's technologies to cost-effectively avoid all use of depletable resources in building and operating facilities. Because this alternative includes some level of construction, it would impact natural or depletable resources and energy to some extent. Generally, the amount of resources and energy used in a building is related to its size. Other park assets that support visitor use and resource protection such as parking lots and trails also potentially use depletable resources to some extent; however, the park's practice is to use wood or recycled material (renewable resources) for boardwalks. Increases or decreases to trails would not impact depletable resource or energy use. The change in the amount of square footage in buildings is used in this analysis to approximate the level of resource and energy use.

Implementing alternative 3 would involve a small increase in energy requirements compared to alternative 1 because of the proposed new buildings that would need energy to operate.

IMPACTS OF IMPLEMENTING ALTERNATIVE 4

NATURAL RESOURCES

Fishery Resources

In the waters of the multiuse zone (water) impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include impacts on fishery resources and fish habitat caused by boating and fishing in the park. These impacts would continue to be long term, minor to moderate, and adverse.

Proposed management actions under this alternative include designating the West, Middle, and East Featherbed Banks as noncombustion engine use zones. This zone would limit the speed and type of boats entering these waters, thus reducing boat traffic overall as well as reducing the impacts associated with boat traffic such as scarring of seagrass and localized turbidity. This would be a long-term beneficial impact.

The west coast of Elliott Key from the southwest tip of Sands Key south to Elliott Key Harbor would be designated a slow speed zone. The number of boats entering this area would be reduced because not all boats would be able to travel at slower speeds in the shallow water. The slow speed zone would reduce the potential for scarring in the seagrass beds in this area as well as reduce the potential for turbidity in the water column, thus minimizing adverse impacts on the productivity of this habitat and water quality in the area. The slow speed zone would have a beneficial impact on the quality of the fish habitat in this area.

A marine reserve zone where fishing is not allowed would be managed to preserve and improve natural resources. The designation of a marine reserve zone would prohibit commercial and recreational fishing from about 10,502 acres, or about 6% of total park area. About 37% of the park's hardbottom habitat would be within this zone, and 63% would be available for fishing outside of the marine reserve zone. This locally reduced fishing pressure, where fish species could grow larger and therefore exponentially increase in reproductive output, would result in a long-term beneficial impact on park fishery resources.

Even though fishing pressure may increase outside this zone, the anticipated increase in size and abundance of fish within the marine reserve zone is expected to have a spillover effect outside the zone, as documented in other marine reserve zones worldwide. Research has shown that marine reserves deliver a wide range of benefits to conservation, science, and general management. Marine reserves allow not only for the recovery of fish species/stocks, they provide sufficient protection for the ecosystems they encompass (Bohnsack 1996).

Species in both the bay and the reefs outside the marine reserve zone would continue to experience substantial pressures from both commercial and recreational fishing, although if the Fishery Management Plan is fully implemented, commercial fishing would be phased out over time. Some fish would continue to be overfished or subject to overfishing. These impacts would continue to be adverse and minor to moderate in the long term.

There would be an increase in the number of people fishing from the shoreline if a new boardwalk was built facing the bay waters. This would be expected to have a long-term, negligible, adverse impact on park fishery resources.

This alternative would provide a greater benefit to fishery resource habitat in the seagrass than alternative 1 because a larger

area for seagrass beds in the park would be included in protective zoning designation.

These zones include the noncombustion engine use zone, the slow speed zone, and the marine reserve zone, all of which contain seagrass beds.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be the similar to alternative 1. The reduction of adverse impacts from human activities on coral reefs and associated ecosystems, combined with efforts from the United States Coral Reef Task Force, would generally result in beneficial impacts. However, the intensity and duration of the cumulative impact of the above planning efforts would depend on the actual number and type of actions taken to implement the identified fundamental themes.

The fishing prohibition in the marine reserve zone, combined with similar prohibitions and/or restrictions in waters outside of the park boundary, could increase fishing pressure and related impacts of overfishing and marine debris in the few reef patches still open to fishing. This could be a long-term, moderate adverse impact to those overfished reefs, but the overall impact to fish populations and fish habitat would be mitigated by the protection of prime reefs which serve as nursery grounds to maintain populations of fish species, as well as by the anticipated spillover effect of fish populations from the marine reserve.

This alternative would contribute a beneficial impact to the beneficial impacts of other past, present, and future actions resulting in beneficial cumulative impacts.

Conclusion. Long-term, minor to moderate, adverse impacts now occurring to fishery resources and fish habitat in the park would persist in most of the park waters. Such impacts would be dramatically reduced in areas of protective zoning, particularly in the marine reserve zone and around the Featherbeds, resulting in a long-term, beneficial impact to fish and fish habitat in some locations.

Threatened and Endangered Species

Manatee. Manatees are more likely to be found in the warm waters closest to shore, so there would continue to be a 1,000-foot manatee protection area in the waters closest to the shoreline. The manatee protection area would be modified so that the 500 feet nearest the shoreline would be designated a noncombustion engine use zone and the remaining 500 feet would be designated a slow speed zone. Within the noncombustion engine use zone, management would focus on protecting water-based resources and minimizing visitor use impacts. This zone would provide additional protection to the manatee by reducing the potential for boat-related injuries and mortality in the areas where manatees are most likely to occur. The slow speed zone would provide boat operators a greater opportunity to avoid collisions with manatees that are further from shore by increasing their response time. The slow speed and noncombustion engine use zones under this alternative would result in fewer boat groundings in seagrass beds, an important habitat/food source for manatees.

The modifications to the manatee protection area and other zoning would have a long-term, beneficial impact on manatees and manatee habitat in the park.

Section 7 Determination of Effect— The impacts on the manatee under alternative 4 would be small, localized, and beneficial. Measurable beneficial outcomes on individual manatees and the manatee population because of the protective zones are likely. This would equate to a “may affect, not likely to adversely affect” determination.

Sea Turtles. In the waters of the multiuse zone (water), impacts described in the no-action alternative (alternative 1) would be expected to persist. These impacts include potential for collisions with boats,

strangulation and entanglement with marine debris (including lobster and crab traps), hook-and-line fishing, and vessel groundings on sea turtle foraging habitat (coral and seagrass), which may adversely affect sea turtles, particularly loggerhead, hawksbill, and green species. Leatherback and Kemp's Ridley would be less likely to be affected because they are rarely in the park. These impacts would continue to be long-term, minor to moderate, and adverse.

Collisions between boats and sea turtles would be expected to be minimized in the slow speed and the noncombustion engine use zones.

The implementation of a marine reserve zone would result in less derelict fishing gear and commercial lobster trap gear (e.g., monofilament line and traps) in this area, which is known to cause strangulation, entrapment, and fatalities of sea turtles. This would result in the reduction of these threats to sea turtles within this zone. This would be a beneficial, long-term impact on sea turtles. This beneficial impact would be offset if fishing pressure increased outside the marine reserve zone.

Studies in Florida and other areas in the world have shown that artificial light adversely impacts sea turtle nesting. Light on Elliott Key is primarily generated from park service facilities, campground, and visitor harbor, all on the bay side of the island. This light does not reach the nesting beaches, which are on the ocean side of the island. Any light generated by campers in the group campsite, located on the ocean side of Elliott Key, would be minimal and unlikely to reach sea turtle nesting beaches. Overall development on Elliott Key would be minimal because only the Breezeway Loop Trail would be hardened. There would not be a substantial amount of light from the campsites. Mitigation measures such as education efforts regarding the importance of reducing artificial light, additional monitoring and patrols as visitation increases, and possibly limitations on the number of visitors would reduce the level of adverse impacts. The improvement of the existing trail on Elliott Key could increase the number of visitors that venture to the beaches where the turtles tend to nest. This could require that the park change the management of this area to minimize disturbance to the turtles. Additional mitigation measures could also include increased visitor education and increased monitoring throughout the park and particularly in areas near turtle nesting areas. With mitigation, the impacts would be long term and adverse but not negligible.

Section 7 Determination of Effect— Impacts to sea turtles from fishing and boating would persist in most of the park, resulting in a determination of "may affect, likely to adversely affect" for loggerhead, hawksbill, and green species that frequent the park waters.

American Crocodile. Most visitor services and infrastructure in habitat suitable for crocodiles would remain near current levels with the designated paths, with the exception of a possible viewing platform and boardwalk in the vicinity of Convoy Point. This area is north of the designated critical habitat area for the crocodiles and so would not be expected to impact their activities in the park. The mangrove south of the visitor center would continue to be managed primarily to protect the natural habitat characteristics of the area. No additional development within the designated critical habitat would be proposed under this alternative. The impacts of activities on crocodile habitat and activities along the mainland shore would be long-term, negligible and adverse.

Under this alternative, the development footprint on Porgy Key would remain as it is with the addition of a rustic dock and stabilization of the Jones homesite. There are limited areas with suitable habitat on Porgy Key for crocodiles, so the impacts of any proposed development would be minimal and localized. The noncombustion engine zone would include the eastern shoreline of Old Rhodes Key and the waters around Totten Key. Few visitors would be expected in this

area because of the boating restrictions. Although part of the designated critical habitat, there are relatively few crocodiles in this area of the park.

If population of crocodiles were to increase within the park, there could be increased interaction between visitors and crocodiles. The developed area at Adams Key provides an excellent opportunity to orient visitors to designated critical habitat for crocodiles, including appropriate actions when traveling in crocodile habitat. With mitigation, the long-term adverse impact of this alternative on the crocodile population in this area of the park would be negligible.

As a whole, the park protects habitat for the crocodile and serves to further its conservation through education and law enforcement, resulting in long-term beneficial impacts to this species.

Section 7 Determination of Effect— The long-term impacts on the American crocodile under alternative 4 would be both beneficial due to habitat protection and education as well as negligible and adverse in localized areas of critical habitat due to small developments. Mitigation measures would be put in place in the event of more human-crocodile interactions. Overall, this would equate to a "may affect, not likely to adversely affect" determination for the American crocodile.

Smalltooth Sawfish. In the waters of the multiuse zone (water), impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include potential for bycatch, which could occur with any continuation of hook-and-line fishing efforts as well as potential for entanglement in marine debris such as fishing line and nets. These impacts would continue to be adverse, minor to moderate, and long term, although realizing such effects is unlikely given the rarity of smalltooth sawfish in the park. Construction of a boardwalk and platform in the mangroves in the Convoy Point area would affect a small amount of potential shallow water habitat. As in other alternatives, smalltooth sawfish could be affected by any increase in hook-and-line fishing efforts, although any effects are unlikely given the rarity of smalltooth sawfish in Biscayne.

While the establishment of the marine reserve zone in deeper reef habitat is not likely to have a substantial effect on this species that tends to prefer shallow water, it is possible that the implementation of the no-fishing marine reserve zone could have a small yet positive benefit on smalltooth sawfish by reducing bycatch since reports of this species in reef and deeper water habitats, although uncommon, do exist. No other actions that would occur under this alternative would be expected to affect sawfish in the park.

Section 7 Determination of Effect— Existing impacts from fishing would persist in much of the park and may be locally reduced in some shallow water locations zoned for sensitive resources, noncombustion engine use, and slow speed. The section 7 effect determination would be "may affect, likely to adversely affect" for smalltooth sawfish under alternative 4.

Schaus Swallowtail Butterfly and Miami Blue Butterfly. New and expanded development on Adams Key would include a staging area for paddlecraft and possibly minimal facilities for the environmental education center. The level of development on the island would occur near the shore where habitat is less suitable for butterflies and would be unlikely to impact the butterfly population or habitat on the island. The impact on the butterfly population would be long term, negligible, and adverse.

Although visitation to most of Elliott Key is currently low, it is likely that visitation would increase once the hardening of the Breezeway Loop and boardwalk is complete. However, there is typically little interaction between visitors and these butterflies. During installation of the trail, the area would be checked by a qualified biologist to ensure that no individuals or preferred nectar or host

plants would be disturbed. Under this alternative and with any necessary mitigation, the impact on the butterfly population in the park would be long-term, negligible, and adverse.

These impacts associated with park developments could be mitigated by timing trail work so that it does not coincide with butterfly breeding season, minimizing the number of trees that need to be removed during the hardening process, and minimizing changes in the drainage pattern on the island once the trail is completed. With these mitigation measures, the impacts would be long term, negligible, and adverse.

Management of Old Rhodes, Totten, and Swan Keys would be zoned to preserve natural resources with limited visitation, similar to the management currently in place under alternative 1. This would continue to have a beneficial impact on the butterfly populations on these keys. The greatest threat to the butterfly populations and habitat would remain weather-related phenomena.

Continued protection of butterfly habitat on these keys would generally be a beneficial impact to these butterfly species.

Section 7 Determination of Effect — The impacts on the Schaus swallowtail butterfly and the Miami blue butterfly would be both beneficial and long term, negligible and adverse in some locations, but mitigation measures to protect the species' habitat and breeding season are likely to be successful. Overall, the determination of effect for alternative 6 is "may affect, not likely to adversely affect" the Schaus swallowtail butterfly and the Miami blue butterfly.

Stony Corals. In the waters of the multiuse zone (water) impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include the potential for ecological and physical stress to corals from overfishing, fishing debris, anchoring, and/or vessel groundings associated with existing boating and fishing activities. Such impacts are long-term, moderate, and adverse to stony corals and their habitat.

Under this alternative, Legare Anchorage would be reduced in size, although it would continue to be closed to in-water activities and would provide protection to the two species of stony corals that may be in this area.

The creation of a 10,502-acre marine reserve zone would prohibit commercial and recreational fishing and anchoring on approximately 30% of the southern reefs within the park, which include areas known to have healthy populations of stony corals. Because visitors who would otherwise use the area in the marine reserve zone to fish would have to fish elsewhere, boat traffic and anchoring throughout this zone could be expected to decrease. Some of these decreases would be offset by an anticipated increased use of the zone by snorkelers and scuba divers Because the marine reserve zone is expected to reduce fishing and improve ecological balance, reduce fishing debris, reduce vessel groundings, and reduce damage from inappropriate anchoring in stony coral habitat, actions under alternative 4 are expected to have a long-term, beneficial impact. While the nonextractive in-water activities of the snorkelers and divers would pose an increased risk of abrasion of corals and/or sedimentation from accidental touching, kicking, and stepping, these impacts could be mitigated by education and would be on a much smaller scale than the impacts of discarded and improperly used fishing gear currently occurring in the zone and by the beneficial impacts of implementation of the marine reserve zone.

It is anticipated that commercial fishing would be eventually phased out parkwide as provided for in the *Fishery Management Plan* (2014); however, implementation of a marine reserve zone would prohibit all commercial fishing in this zone after passage of a park special regulation. This locally reduced fishing pressure, where targeted fish species could grow larger and therefore increase in

reproductive output, would result in a long-term beneficial impact on the stony coral habitat.

The addition of or relocation of mooring buoys and boundary markers would result in short-term, negligible to minor adverse impacts in specific areas associated with underwater installation and associated impacts to submerged substrates, although every effort would be made to install in locations away from corals, seagrass beds, and submerged cultural resources. Increased public outreach and/or law enforcement efforts would probably reduce the potential for illegal anchoring that could impact stony corals.

The use and maintenance of navigational markers and mooring buoys would continue to minimize impacts to stony corals from unintentional vessel and anchor damage.

Section 7 Determination of Effect— Existing boating, fishing, and marine debris impacts would persist in much of the park waters and continue to impact stony corals and their habitat. The marine reserve zone is expected to have a beneficial long-term effect on stony corals within that area by protecting them from activities that could lead to physical and ecological damage, thus reducing but not eliminating the adverse effects parkwide. Thus, this alternative would result in a determination of "may affect, likely to adversely affect" on stony corals.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. Alternative 4 would result in negligible adverse and beneficial impacts on federally listed species. When combined with the impacts of other past, present, and future actions, the overall cumulative effect would be negligible and beneficial. Alternative 4's contribution to these cumulative impacts would be slight.

Conclusion. Existing impacts to listed species and their habitat would persist in much of the park, particularly in the multiuse zone. Some impacts would be reduced through changes in zoning that would be expected to have beneficial impacts, most notably the stony corals and other marine species in the marine reserve zone. Under this alternative there would be proposed minor development that could impact American crocodiles, sea turtles, Schaus swallowtail butterflies, and Miami blue butterflies. The park would continue to coordinate with the U.S. Fish and Wildlife Service and NOAA Fisheries and work to mitigate any adverse impacts on these species. Thus, the section 7 determination would be that this alternative "may affect, not likely to adversely affect" for those species. However, existing impacts to sea turtles, stony corals, and smalltooth sawfish would continue to be long term, moderate and adverse and would result in a "may affect, likely to adversely affect" determination although there are no new adverse impacts to these species associated with any proposed actions. Taking action on this alternative to protect reefs from other pressures such as overfishing and physical damage from fishing gear, anchoring, and vessel groundings might also increase reef resiliency, potentially delaying the effects of global-scale stressors such as climate change, ocean acidification, and land-based sources of pollution (Jackson 2014). This is expected to result in beneficial impacts for stony corals and the listed species that depend on reef habitats such as sea turtles.

Cumulative effects would be negligible and beneficial. This alternative would contribute a small amount to the overall cumulative effects.

Special Status Species, Including State Listed Species

Birds. Arsenicker and West Arsenicker Keys host wading bird colonies including state listed wading birds and state listed white-crowned pigeons, and West Arsenicker also hosts nesting bald eagles. These keys would be zoned sensitive resource zones and would remain closed to visitors. Thus, there would be no effect on the West Arsenicker Key bald

eagle population, state listed wading birds, or white-crowned pigeons, or nesting activities for these species under this alternative. Furthermore, the creation of a noncombustion engine zone extending 500 feet from the sensitive resource zones around West Arsenicker and Arsenicker Keys would further reduce the likelihood of disturbances to bald eagles or any other state listed birds using these islands.

Under this alternative, the islands surrounding Jones Lagoon would be zoned nature observation zones. The waters of Jones Lagoon would be designated a noncombustion engine use zone. Visitation would be allowed on the islands of Jones Lagoon, so there would be human-caused intrusions to birds nesting, roosting, loafing, and/or foraging there. Actions under alternative 4 would reduce, although not eliminate, the potential for disturbance to birds using the Jones Lagoon area because there is still the possibility that small vessels (e.g., paddlecraft) and people coming ashore could closely approach birds nesting on the islands inside Jones Lagoon.

The establishment of a visitor service zone on Porgy Key could encourage visitation to the Jones Lagoon area, although the difficulty in accessing this area and the specialized equipment and knowledge needed to safely traverse Jones Lagoon would keep the likelihood of this fairly low. Given that visitation to Jones Lagoon would be expected to remain minimal, adverse impacts on the birds and their habitat would be minor. If visitation increases such that any state listed birds could be disturbed, management actions could include limiting access to areas where birds are known to nest during nesting season and/or establishing set-back distances following recommendations in scientific literature, since human disturbance has the potential for nesting birds to inadvertently crush their eggs while fleeing or to temporarily or permanently abandon their nests, thereby exposing the eggs to predators and extreme temperatures. Under this alternative, the long-term adverse impact on the state listed bird populations in the park and potential nesting activity on the Jones Lagoon area would be minor.

The proposed slow speed zone on the northern bay side of Elliott Key would be expected to reduce the likelihood of disruptions to birds using the coastal areas immediately adjacent to this zone. As a result, beneficial effects on state listed birds in the immediate area would be expected.

Under this alternative, birds using coastal habitats along the park's mainland shoreline would receive protection from potential boat-related disturbances from (1) the noncombustion engine use zone that extends 500 feet east from the mainland (excluding Black Point, Convoy Point, and Turkey Point Channels), and (2) a slow speed zone covering the area 500 to 1,000 feet from the shoreline. By reducing the use of waters immediately adjacent to the mainland shoreline, potential boat-related disturbances would be expected to be reduced for birds that are roosting, nesting, foraging, and/or loafing along the mainland shoreline.

Overall, this alternative, including any necessary mitigation would probably result in long-term, negligible, adverse due to the proposed development in this alternative. There would be beneficial impacts on state listed bird populations and nesting activity in the park due to the establishment of protective zones around the above mentioned keys.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be the similar to those described under alternative 1. Alternative 4 would result in negligible impacts on listed birds due to increased visitor use and construction of minor visitor facilities. When combined with the impacts of other past, present, and future actions, the overall cumulative effect would be minor and adverse. This alternative would have a small contribution to the overall cumulative effects.

Conclusion. Under this alternative there would be proposed development that could result in long-term negligible adverse impacts on state listed species and would not be likely to lead to federal listing. There would be beneficial impacts to state listed birds through protective zoning which would reduce the likelihood of disturbance in important bird habitats caused by visitor activities.

Terrestrial Vegetation

Under this alternative, the adverse impacts on terrestrial vegetation on the keys, particularly the hardwood hammocks, would be greater than for alternative 1. Boca Chita, Elliott, Adams, and Porgy Keys would have small areas managed for visitor access and recreation. Visitation to these keys would be concentrated in the developed areas. Impacts from increased visitation could include trampling of vegetation and social trails. In general these impacts could be mitigated by visitor education efforts and trail design that would keep visitors on the existing trails. With mitigation measures in place, the adverse impacts of increased visitation on terrestrial vegetation would be long-term, negligible to minor and adverse.

The proposed development on Boca Chita, Elliott, Adams, and Porgy Keys would be kept within areas that have been previously disturbed to the extent practicable. Access to the Jones homesite on Porgy Key would be managed to minimize impacts on sensitive resources. Some localized impacts could occur, but the adverse impacts on vegetation on the keys would be minimal. Any areas cleared during construction would be revegetated to minimize the long-term adverse impacts of the proposed development. The adverse impacts on vegetation on the islands from proposed development would be localized and negligible.

Under this alternative, overall development on Elliott Key would be minimal because only the Breezeway Loop Trail and boardwalk would be hardened. Because the trail already exists, the impacts on the vegetation would be minimal. Foliage removal on larger trees near the trail would be avoided to the extent possible. The trail would also be constructed to minimize changes in drainage that could occur because the trail has been hardened. With this mitigation, the impacts on the vegetation would be adverse but negligible to minor in the long term.

Long-term impacts from the proposed Convoy Point boardwalk would include the removal of mangroves and other wetland plants, trimming of mangroves, and have shading impacts on mangroves and other vegetation. Impacts would be adverse, minor, and long term.

Under this alternative, much of the mainland shoreline, Sands Key, and the islands surrounding Jones Lagoon would be zoned as nature observation zones and visitation would be allowed, however protection would be emphasized. This expected to have a long-term beneficial impact on terrestrial vegetation on these islands.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. When the negligible to minor adverse impacts of alternative 4 development and beneficial impacts of resource protection and education are combined with the impacts of other past, present, and future actions, the resulting cumulative impacts would be beneficial. This alternative would slightly reduce these beneficial cumulative impacts.

Conclusion. Implementing this alternative would result in long-term, negligible to minor, adverse impacts on terrestrial vegetation in localized areas associated with minor construction projects and continued or increasing visitor use. Beneficial impacts would continue due to ongoing resource stewardship of terrestrial vegetation. Adverse impacts would be less than alternative 2 due to the smaller footprint of trail improvements on Elliott Key.

Wetlands

Wetlands in the park would continue to serve as an important habitat area for a wide variety of terrestrial and aquatic species in the park. Placement of the nature observation zone along the mainland would give greater protection to mangrove shorelines. This would have long-term, beneficial impacts.

Under this alternative, a shoreline boardwalk would be developed through the mangrove forest to link the canals in the park. Construction of the boardwalk would cause both short-term and long-term impacts on the wetlands along the mainland shoreline. During construction there would be short-term adverse impacts on water quality from increased turbidity. Increased turbidity in the water column would temporarily degrade the habitat for aquatic species, which could also impact terrestrial species, particularly birds. These adverse impacts would be minor to moderate but localized. Long-term impacts would come from the removal of mangroves and other wetland plants and the shading of seagrasses, mangroves, and other vegetation from the boardwalk that could reduce the type and density of the mangroves near these developments. The localized adverse impacts would be long term and minor.

No additional access into the mangroves that fringe the keys would be developed under this alternative, so there would be no change in the current size, integrity or continuity of the wetland areas in the park. Mangroves are extremely difficult to walk through and so the proposed visitor facility improvements at Porgy, Adams, Elliott, and Boca Chita Keys might attract more visitors but are not likely to affect the wetlands.

Cumulative Impacts. The actions proposed in the Biscayne Bay Coastal Wetlands Project could improve the overall health of wetland areas along the mainland shoreline such that the system as a whole is better able to accommodate the stresses associated with the short- and long-term impacts of the development and human use in the area.

Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. This alternative would contribute minor adverse impacts to the beneficial impacts of other present and future actions resulting in a beneficial cumulative impact. The contribution of this alternative to these cumulative impacts would be small.

Conclusion. Localized impacts associated with construction under this alternative would be short term, minor to moderate adverse. The long-term impacts of the new facilities would be long-term, minor and adverse but mitigated through design and would be adverse and minor.

Submerged Aquatic Communities

In the waters of the multiuse zone impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include impacts on submerged aquatic communities caused by boating and fishing and associated marine debris. These impacts would continue to be long term, minor to moderate, and adverse.

Under this alternative, there would be greater controls on speed and vessel types in areas where there are submerged aquatic communities, particularly seagrass beds.

The West, Middle, and East Featherbed Banks, the area extending 500 feet from the mainland shoreline, and the waters within Jones Lagoon and around Totten Key would be zoned for noncombustion engine use. Boats in this zone would be traveling relatively slowly, and fewer boats would be operating with high-speed propellers so the potential for scarring of the seagrass beds would be substantially reduced. Within the noncombustion engine use zone, the potential for turbidity in the water column caused by motorboats would also be reduced. Thus, the

productivity of the seagrass beds would be higher under this alternative—a long-term beneficial impact.

The bay side of Elliott Key from Sands Cut to Elliott Key Harbor and a strip along the mainland shore from 500 to 1,000 feet adjacent to the noncombustion engine use zone along the mainland would be zoned as a slow speed area to protect natural marine resources such as seagrass. Because the boats in these areas would be traveling at a reduced rate of speed, there would be reduced potential for seagrass scarring. The proposed marine reserve zone is also expected to protect seagrass beds within zone boundaries because of the addition of mooring buoys.

The proposed Convoy Point boardwalk would result in a removal of a small amount of mangroves and other wetland plants, trimming of mangroves, and have shading impacts on mangroves and other aquatic life. Impacts would be long-term, minor, and adverse. The boardwalk would be designed to avoid and minimize these impacts to the extent possible.

Under this alternative, a marine reserve zone would be designated from Hawk Channel east to the park boundary. The marine reserve zone would be managed to preserve natural resources with minimal human-caused intrusions. Boat size, type, and speed could be regulated to protect resources in this zone. It would be expected that the adverse impacts on the reef from boating and fishing activities would be significantly reduced under this alternative. In particular, the potential for scarring from boat propellers or anchors would be greatly reduced, but there could still be adverse impacts from other currently existing recreational activities such as scuba diving. These adverse impacts from scuba diving on the structure and function of the coral reef as habitat would be the same as for alternative 3. Implementation of the reserve zone would reduce the impacts of recreational activities in this area of the reef, and could potentially increase the resiliency of the reefs within this zone to external pressures such as marine debris, pollution, climate change, ocean acidification and coral bleaching (Mumby et al. 2013), resulting in a long-term beneficial impact. Impacts from fishing and anchoring would continue outside the marine reserve zone.

It is anticipated that commercial fishing would be phased out parkwide as provided for in the *Fishery Management Plan* (2014); however, implementation of a marine reserve zone would prohibit commercial and recreational fishing in this zone after passage of a park special regulation. This locally reduced fishing pressure, where targeted fish species could grow larger and therefore increase in reproductive output, would result in a long-term beneficial impact on submerged aquatic habitats.

The addition or relocation of mooring buoys and boundary markers would result in short-term, minor adverse impacts in specific areas associated with underwater installations and associated impacts to submerged substrates, although mooring buoys and boundary markers would be placed away from corals, seagrass beds, and submerged cultural resources. Increased public outreach and/or law enforcement efforts would probably reduce the potential for illegal anchoring that could impact submerged aquatic communities and thus is a beneficial impact.

Overall, the productivity of the seagrass beds would be expected to increase under this alternative because of the increased areas zoned for slow speeds and noncombustion engine use and the addition of a marine reserve zone. The increase in productivity in the seagrass beds would be a long-term beneficial impact.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. Alternative 4 would result in long-term beneficial impacts. When combined with the adverse impacts of other past, present, and future actions, the cumulative impacts would be minor to

moderate and adverse. The contribution of this alternative to these cumulative impacts would be small.

Conclusion. Alternative 4 would result in long-term, minor to moderate adverse impacts to seagrass beds and corals in much of the park zoned for multiuse due to ongoing boating and fishing activities. However, in areas zoned for resource protection, including the marine reserve zone, there would be beneficial impacts on submerged aquatic communities.

Soundscapes

In the waters of the multiuse zone impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include short-term, minor to moderate adverse impacts caused by boat noise on the water as well as short-term negligible adverse impacts caused by vehicles and routine maintenance equipment on land. In both cases, these noises can transcend the zone in which they originate and be heard in adjacent zones.

Natural soundscapes predominate in the distant portions of the park, away from popular boating routes. Increases in visitation on weekends and during special events add to the number of boats on the bay at one time. The expanded developed area according to city and county plans with its associated population increase is expected to continue and would be expected to result in increased boating and boat engine noise. Impacts associated with an increased number of boats in the park would be short term, minor to moderate, and adverse.

Under alternative 4, there would be areas of the bay zoned for slow speed or noncombustion engine use. Because these restrictions would reduce the level and duration of noise from boats, there would be long-term, beneficial impacts on soundscapes on portions of the bay and adjacent land.

There would a limited amount of new construction in this alternative occurring mostly in the visitor service and park administration zone. This would result in short-term, localized, adverse impacts that would be negligible to minor in intensity. Use of the new or upgraded facilities would result in a long-term negligible adverse impact to natural soundscapes.

Existing natural soundscapes in the interior of the larger keys would continue to be preserved by protective zoning and relatively low visitor use—a continuing beneficial impact.

Cumulative Impacts. The expanded developed area according to city and county plans with its associated population increase is expected to continue and would be expected to result in increased boating and boat engine noise.

The beneficial and adverse impacts of this alternative, in combination with the adverse impacts of other actions, would result in minor and adverse cumulative impacts on the natural soundscape; however, the contribution of this alternative to these impacts would be a slight reduction of these adverse cumulative impacts.

Conclusion. Implementing alternative 4 would have long-term beneficial impacts on soundscapes due to protective zoning. Short-term negligible to minor, adverse impacts during construction and existing minor to moderate adverse impacts on natural soundscapes would continue as a result of persistent boat-related noise in much of the park. Existing negligible, short-term adverse impacts on natural soundscapes would continue as a result of routine park operations and maintenance activities.

CULTURAL RESOURCES

Archeological Resources (including submerged archeological)

Implementation of this alternative would have similar impacts on archeological resources as those listed in alternative 1. The strong emphasis on cultural resource protection could be expected to have some additional beneficial impacts on archeological resources (including submerged archeological) sites.

Actions under this alternative, such as exclusion of visitors from West Arsenicker, Arsenicker, and Swan Keys, prohibition of anchoring and recreational and commercial fishing between Hawk Channel and the park's eastern boundary would generally contribute to beneficial impacts on potential and known terrestrial and submerged archeological sites. These added protections would provide less potential for treasure hunting, looting, amateur collection, and inadvertent visitor impacts.

Under alternative 4 archeological resources could be adversely impacted by the following specific actions on keys selected as principal visitor destination points:

- expanded recreational development for day use and camping and adaptive use of historic Boca Chita Key
- improvement of existing trail and possibly establish staging area for paddlecraft on Elliott Key
- improved visitor services and facilities and development of a small commercial visitor services facility and staging area for paddlecraft on Adams Key
- construction of a dock to facilitate vessel access on Porgy Key

All ground-disturbing activities would be preceded by site-specific archeological surveys and, where appropriate, subsurface testing to determine the existence of archeological resources and how best to preserve them. Known archeological resources would be avoided to the greatest extent possible. Few adverse impacts on archeological resources from construction would be anticipated, but any adverse impacts would be permanent and minor in intensity.

Although ongoing and expanded archeological site monitoring programs would be initiated and efforts would be undertaken to minimize or mitigate potential impacts from human activities, increased recreational use, and access to areas of the park that could result in the disturbance of archeological resources because of inadvertent visitor impacts or vandalism. A loss of surface archeological materials, alteration of artifact distribution, and a reduction of contextual evidence could result. Continued ranger patrol and emphasis on educating the general public and scuba diving community regarding the significance and fragility of archeological resources would discourage illicit activities and inadvertent impacts and help minimize adverse impacts. Adverse impacts would primarily be minor and permanent.

Although stabilization/interpretation of the Jones homesite historic ruins on Porgy Key would enhance protection of those archeological resources as a beneficial impact, more visitors would be drawn to the area, thus increasing the possibility of disturbance, degradation, or loss of resources as a result of inadvertent human activities or vandalism at a site that was formerly protected by its isolation and relative inaccessibility. The latter would be a long-term, minor, adverse impact.

Provision for a wide variety of expanded recreational activities on most of the park's water acreage, Elliott Key (not including the visitor services / park administration zone), and the mainland between Convoy Point and Black Point Park could result in disturbance, degradation, or loss of resources associated with the Offshore Reefs Archeological District as well as other submerged and terrestrial archeological resources scattered throughout the park.

Archeological (and submerged archeological) resource protection would be a high priority in the nature observation zone that would be managed to limit intensive visitor use. Under this alternative, this includes three mainland areas and Ragged, Sands, Rubicon, Reid, Old Rhodes, Totten, Gold, East Arsenicker, Long Arsenicker, and Mangrove Keys. Nevertheless, self-directed visitor activities designed to immerse visitors in relatively remote surroundings would potentially subject known and unknown archeological (terrestrial and submerged) resources in the park to disturbance as a result of inadvertent human activities or vandalism because visitors would be drawn to areas that were formerly closed to visitors or protected by their relative isolation.

Reduction of Legare Anchorage to about 1 square mile would continue to afford protection to sensitive underwater archeological resources in the Offshore Reefs Archeological District. Better navigational markings and more logical coordinate-based designation of the protected zone might result in improved public compliance with the regulations in Legare Anchorage. Closure of Legare Anchorage to commercial trapping would reduce resource damage from snagged gear. These steps could be expected to provide additional protection that would result in a long-term and localized beneficial impact on archeological resources.

Potential archeological resources on West Arsenicker and Arsenicker Keys and in the water extending out 500 feet from them and on Soldier and Swan Keys would continue to be protected by keeping them closed to visitors and only permitting research under a permit. This continued protection would provide a long-term and localized beneficial impact on archeological resources.

Also, although this alternative increases the potential impact on submerged archeological resources from visitor access threats, the establishment of a marine reserve zone can be expected to lessen the impact damage associated with anchoring and commercial fishing and trapping activities on archeological sites. Adverse impacts associated with increased visitor access would be minor and permanent; beneficial impacts associated with the establishment of the marine reserve would also be permanent.

Under this alternative, a marine reserve zone would be designated from Hawk Channel east to the park boundary. The marine reserve zone would prohibit recreational and commercial fishing and phase out anchoring on many of the southern reefs in the park, which includes potential maritime and cultural landscape areas. This prohibition of fishing would virtually eliminate the on-site generation of fishing-related marine debris and its associated impacts on submerged cultural resources, which would be a long-term beneficial impact. The potentially increased scuba diving-related activities associated with a healthy and attractive coral reef system could have negligible to minor adverse impacts on submerged cultural resources due to depreciative visitor behaviors and accidental damage. Impacts from fishing and anchoring would continue outside the marine reserve zone.

The addition of or relocation of mooring buoys and boundary markers would result in long-term beneficial impacts to submerged cultural resources, as they would provide protection to sites from the threat of anchor damage. With increased public outreach and/or law enforcement efforts reducing the potential for illegal anchoring, these long-term benefits would be enhanced. The installation of mooring buoys in conjunction with no anchoring zones would also result in long-term beneficial impacts to submerged cultural resources sensitive to visitation pressure by providing a means of controlling visitor carrying capacity at the sites.

Cumulative Impacts. Impacts associated with other past, present and reasonably foreseeable actions would be similar to those described under alternative 1. As described above, implementation of alternative 4 would result in permanent, negligible to minor,

adverse impacts and beneficial impacts. The impacts of alternative 4, in combination with both the long-term, negligible to minor adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a permanent, negligible to minor, adverse cumulative impact. The adverse impacts of alternative 4, however, would be a small component of the adverse cumulative impact.

Conclusion. Implementation of this alternative would have similar impacts on archeological resources as those listed under alternative 1. The strong emphasis on cultural resource protection and protective zoning could be expected to have some additional, long-term beneficial impacts on archeological sites. This alternative's contribution to these cumulative impacts would be small.

Section 106 Summary. The implementation of this alternative could include some minor adverse impacts on archeological resources. If impacts remain minor there would be no adverse effects under section 106. Any adverse impacts resulting from moderate or major impacts would be mitigated through the use of *The Secretary of the Interior's Standards and Guidelines for Documentation and Treatment of Historic Properties* and a memorandum of agreement with the state historic preservation office and the Advisory Council on Historic Preservation to counteract such adverse effects.

Historic Structures and Buildings

Implementation of alternative 4 would have similar impacts on historic structures and buildings in the Boca Chita Key Historic District, Jones Family Historic District, and at Fowey Rocks Lighthouse as those listed under alternative 1 because they would be rehabilitated, preserved, and adaptively used in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. Some minor elements of historic fabric could be lost as a result of remodeling/ rehabilitation efforts and anticipated increasing visitation levels. These adverse impacts could result in a negligible to minor, short-term, impact from inadvertent visitor use or vandalism. As with alternative 1, impacts on historic structures and buildings would be primarily localized, long-term to permanent, and mostly beneficial.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be the similar as those described under alternative 1. As described above, implementation of alternative 4 would result in negligible to minor adverse impacts and beneficial impacts. The impacts of alternative 4, in combination with negligible to minor adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a negligible to minor cumulative impact. The adverse impacts of alternative 4, however, would be a small component of the adverse cumulative impact.

Conclusion. Implementation of this alternative would have similar impacts on historic structures and buildings in the Boca Chita Key Historic District as those listed under alternative 1 because they would be rehabilitated, preserved, and interpreted by the National Park Service in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. As with alternative 1, impacts on historic structures and buildings would be localized, long term to permanent, and generally beneficial.

Actions under this alternative would generally have similar cumulative impacts on historic structures and buildings in the park as those listed under alternative 1. Implementation of this alternative would have cumulative beneficial impacts.

Section 106 Summary. The implementation of this alternative could include some minor adverse impacts on historic structures and buildings. If impacts remain minor there would be no adverse effects under section 106. Any adverse impacts resulting from moderate or major impacts would be

mitigated through the use of *The Secretary of the Interior's Standards and Guidelines for Documentation and Treatment of Historic Properties* and a memorandum of agreement with the state historic preservation office and the Advisory Council on Historic Preservation to counteract such adverse effects.

Cultural Landscapes

Implementation of this alternative would have similar impacts on cultural landscapes in the park as those listed under alternative 1 because potential landscapes would continue to be surveyed, inventoried, and evaluated under National Register of Historic Places criteria, and the National Park Service would implement resource management policies that preserve the natural resource values and culturally significant character-defining patterns and features of Boca Chita Key as well as other listed, or determined eligible, landscapes in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties With Guidelines for the Treatment of Cultural Landscapes*.

Although this alternative would emphasize strong cultural resource protection, enhancement of recreational opportunities and development of visitor services and facilities on Boca Chita, Elliott, and Porgy Keys could result in some minor impacts on the integrity of the listed and potential cultural landscapes at those visitor destination points. Although expansion of recreational opportunities and development of enhanced visitor services throughout much of the park's lands and waters could also result in some minor impacts on the integrity of the potential parkwide maritime and cultural landscape, actions under this alternative, such as the creation of the marine reserve zone would generally contribute to beneficial impacts to a potential marine cultural landscape. Restoration activities at the Jones homesite would have localized, long-term beneficial impacts as well.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. As described above, implementation of alternative 4 would result in negligible to minor adverse impacts and beneficial impacts. The impacts of alternative 4, in combination with negligible to minor adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a negligible to minor cumulative impact. The adverse impacts of alternative 4, however, would be a small component of the adverse cumulative impact.

Conclusion. Implementation of this alternative would have similar beneficial impacts on cultural landscapes as those listed under alternative 1. Although this alternative would emphasize strong cultural resource protection, provision for diversified recreational opportunities and development of enhanced visitor services and facilities in some areas of the park could result in long-term, minor, adverse impacts on the integrity of the potential cultural landscapes in the park.

Section 106 Summary. The implementation of this alternative could include some minor adverse impacts on cultural landscapes. If impacts remain minor there would be no adverse effects under section 106. Any adverse impacts resulting from moderate or major impacts would be mitigated through the use of *The Secretary of the Interior's Standards and Guidelines for Documentation and Treatment of Cultural Landscapes* and a memorandum of agreement with the state historic preservation officer and Advisory Council to counteract such adverse effects.

VISITOR EXPERIENCE

Diversity of Visitor Activities

Under this alternative, visitors would continue to have unrestricted access (as described in the multiuse zone) to most of the park's

waters (approximately 77%) to participate in a wide range of recreational opportunities such as motorboating, sailing, paddling, swimming, scuba diving, snorkeling, fishing, and nature study. About 13% of the park would have some restrictions or changes (existing and new) that would potentially enhance, modify, limit, or prohibit visitor access and activities.

This alternative would require visitors to maintain slow speeds near the mainland and Sands Cut. It would also add a slow speed zone to Caesar Creek and the west side of Elliott Key between Elliott Harbor and Sands Cut. These slow speed zones would help visitors focus attention on these relatively shallow, sensitive, and sometimes busy areas of the bay. Slower speeds would help reduce the frequency of boat groundings, which would be an indirect, long-term, beneficial impact on some visitors. Some visitors would have boats with too deep a draft to be able to operate successfully at slow speeds in these areas and would be excluded from access. For some visitors this change would be perceived as a minor, adverse, impact on their visitor experience while boating in the park. For other visitors these reduced speeds would enhance their sense of safety and opportunities for swimming, wading, and fishing. The total area of park waters that would have slow speed restrictions would be about 1.5% of park waters.

The noncombustion engine use zone would include four areas that generally are shallow, where caution is needed, and where different visitor experiences are available. These include the West, Middle, and East Featherbed Banks on either side of the Intracoastal Waterway west of Boca Chita Key; the waters within 500 feet of the mainland; the waters encircling West Arsenicker and Arsenicker Keys' sensitive resource zone; and the waters surrounding the southern keys, including Old Rhodes Key and Jones Lagoon. This prohibition of combustion engine use (with some limited exceptions) would potentially have a negative impact on those visitors who are used to using these areas of the park with combustion engines. Some visitors would have boats with too deep a draft to be able to operate successfully at the slower speeds in these areas and would be excluded from access. For some visitors this change would be perceived as a long-term adverse impact on their visitor experience while boating in the park. This zoning would potentially have a beneficial impact on the experience of many visitors who currently use or would like to use these areas of the park to paddle and explore the mangroves and more remote key environments. Prohibiting combustion engines would enhance visitor's abilities to more successfully see wildlife and experience the natural sounds of the bay and mangrove environments as well as increase the likelihood that some visitors would be able to achieve a sense of solitude and tranquility. Also, boaters would have less likelihood of grounding in this zone, and flats anglers would have improved conditions for successful catches. This noncombustion engine use zone would affect about 1.7% of park waters.

Under this alternative, Legare Anchorage would be rezoned and reduced in size relative to current conditions. This would result in visitors having access to an additional 1,700 acres of reef waters for a full range of recreational activities (multiuse zone). The sensitive underwater archeological zone, which would be applied to a smaller area at Legare Anchorage, would allow for limited visitor access, which is currently the case. The addition of 1,700 acres to the multiuse zone would provide visitors enhanced opportunities for access and recreation, which would be a long-term beneficial impact on visitors' abilities to access and recreate in park waters.

The continued closure to visitors of West Arsenicker and Arsenicker Keys would not change. What would change under this alternative is the application of the sensitive resource zone 500 feet out from the keys' shorelines and a noncombustion engine use zone extending out another 500 feet from the sensitive resource zone. This would be a modest increase over the current 200-foot

closure. Also, Swan Key would be closed to visitors. This area is currently lightly used because of limited accessibility; however, those visitors who expect unrestricted access might find this closure to be a long-term, minor, adverse impact on their ability to experience the area.

Northern and southern portions of the mainland, the southern keys, and all of Sands Key would be zoned nature observation. The relative inaccessibility of the mangrove forests and tropical hardwood hammocks naturally limits the range of visitor activities. Most visitors to these areas would likely experience few interactions with others and would have opportunities to explore, observe nature, and find solitude. Also, Sands Key is currently closed to the public. Making it available to the public would be a long-term positive impact on visitor opportunities to experience this key.

The marine reserve zone in this alternative sets aside a small portion of park waters from consumptive activities. It is intended to offer visitors unparalleled recreational experiences, including the opportunity to experience an intact, unfished coral reef. Marine scientists throughout the world have found that marine reserve zones afford protection that allows reef ecosystems to recover from consumptive activities and related debris. Heightened protection could provide and sustain the type of visitor experience for which the park was established. With proper protection, Biscayne's signature feature, its coral reef, could become one of South Florida's premier tourist destinations for scuba divers, snorkelers and marine enthusiasts.

An area from Hawk Channel to the eastern park boundary (about 6% of park waters) would be placed in the marine reserve zone. Visitors to this zone would be able to engage in most of their current activities, and the concessioner would continue to be able to take visitors here. However, in the marine reserve zone, visitors would not be able to engage in recreational and commercial fishing. For these visitors this restriction would result in a minor to moderate adverse impact on their visitor experience. However, because marine reserves worldwide have documented spillover effects where more fish and bigger fish leave the reserve and become available to visitors fishing outside the reserve, a beneficial impact would be expected for visitors fishing immediately outside the marine reserve zone.

Visitors who snorkel and dive in the marine reserve zone would be able to experience a healthier, more natural coral reef than what is currently present, with larger and more numerous tropical reef fish and an ecologically intact reef system. The increased number of mooring buoys would make the snorkeling and scuba diving experience safer and easier. Therefore, a beneficial impact would be expected for visitors who snorkel and dive in the marine reserve zone.

Anchoring would not be allowed in the marine reserve zone and some visitors may feel this is adverse impact on their visitor experience. However, this should not be an adverse impact as additional mooring buoys would be provided to facilitate access to reefs and historic shipwrecks within this zone as described in the Mooring Buoy and Marker Plan.

Visitor Services and Facilities

The northern half of Boca Chita Key would be designated as a visitor services / park administration zone. Some of the historic structures could be used for expanded visitor services that might be provided through on-site staff or wayside exhibits. This would be a beneficial impact on enhancing visitor's opportunities to learn about and experience the key.

In the harbor area at Elliott Key, accessibility for visitors would be enhanced through the hardening of the trail connecting the harbor with the ocean side. This would be a beneficial enhancement of visitor opportunities to better access the ocean side of Elliott Key.

The park would consider using Adams Key as a backup staging area for paddlecraft and might use Adams Key as a staging area for paddlecraft to access Porgy Key during special events or programs on that key.

At Porgy Key, a paddlecraft dock and the interpretation of the old Jones homesite would provide long-term beneficial improvements in visitor opportunities to learn about and experience that key.

Cumulative Impacts. The expanded developed area according to city and county plans with its associated population increase that is expected to continue are being recognized by local, regional, state, and federal entities as major concerns affecting the region's environmental, economic, and community values. To this end there are a number of recent and ongoing studies and partnership efforts underway in the Biscayne Bay area to improve and protect water quality and quantity, wetlands, fishery resources, and coastal viewsheds. Projects include the *Fishery Management Plan* for Biscayne National Park; the *South Miami-Dade Watershed Study and Plan*; the *Biscayne Bay Surface Water Improvement and Management Plan*; the *Lower East Coast Regional Water Supply Plan*; the Biscayne Bay Partnership Initiative; the Southeast Florida Coral Reef Initiative; and the *Biscayne Bay Coastal Wetlands Plan*.

The actions of this alternative, especially park zoning that could enhance resource conditions, such as the slow speed, noncombustion engine use, sensitive resource, and nature observation zones, combined with these ongoing regional efforts, would have the potential to improve the quality of visitor activities in the region, especially related to fishing, nature viewing, and other resource-based recreational activities. There would also be improved visitor opportunities to learn from various sources regarding the importance and complexity of restoration efforts in a rapidly growing urban environment.

Adjacent state parks (such as Bill Baggs Cape Florida State Park, Key Largo Hammock Botanical State Park, and John Pennekamp Coral Reef State Park) and the Florida Keys National Marine Sanctuary offer services, facilities, and recreational opportunities that enable visitors to experience and learn about the natural and cultural resources of the Biscayne Bay and Florida Keys region. Also, current efforts through the GMP Amendment: Stiltsville Management Plan and the Biscayne Bay Coastal Wetlands project provide potential opportunities for enhanced visitor access, education, and recreation related to the Biscayne Bay area.

The actions of this alternative to improve access and recreational opportunities and facilities would have the potential positive contribution of more and better public information about and access to the Biscayne Bay area and enhanced opportunities to learn about and recreate there, especially enhanced paddling opportunities.

The fishing prohibitions in the marine reserve zone, combined with similar prohibitions and/or restrictions in waters outside the park boundary, could increase crowding in the reef still open to fishing. This could be a long-term, moderate adverse impact to visitor experience of those fishermen.

Alternative 4 would have beneficial and adverse impacts and when combined with the beneficial impacts of other actions would result in beneficial cumulative impacts on visitor experience in the area. Alternative 4's contribution to these cumulative impacts would be small.

Conclusion. Additional speed restrictions and new noncombustion engine use zones would exclude some visitors from these areas, which would be a long-term, minor adverse impact. The same zones would help over time to separate conflicting visitor uses, increase boating safety, increase nonmotorized opportunities, and increase opportunities for solitude, which would be long-term beneficial impacts on some visitors' experiences.

Upgrades in visitor information, services and facilities would be limited but result in a long-term beneficial impact on some visitors' experiences. Both long-term, minor, adverse and beneficial impacts would occur to different visitors from implementing the marine reserve zone. This alternative would have small contributions to the impacts of other actions, resulting in beneficial cumulative impacts on visitor experience in the area.

NPS OPERATIONS AND FACILITIES

Actions under alternative 4 would generally have the same impacts on park operations and facilities at Convoy Point and Porgy, Adams, Elliott, and Boca Chita Keys as the previous alternatives, although the zones for visitor services on the keys would be smaller (visitor services / park administration zone would cover 20 acres compared with 170 acres under alternative 2).

However, actions under alternative 4, with its emphasis on strong natural and cultural resource protection and development of as many as nine potential visitor contact points outside of the park while providing a diversity of visitor experiences inside the park, would require additional law enforcement and resource management staff and equipment to enforce the park's regulations and protect its resources. The new marine reserve zone as well as the expanded nature observation zone and noncombustion engine use zone would require additional park staff time to manage. These actions would result in short-term, minor to moderate, adverse impacts on the park's budget because of equipment acquisition, and long-term, minor, adverse impacts on the park's budget because of the employment of additional personnel and from equipment maintenance.

Cumulative Impacts. As discussed under alternative 1, past and ongoing cooperative planning and development projects in the Biscayne Bay region, such as the Biscayne Bay Partnership Initiative, *Miami-Dade County Comprehensive Development Master Plan*, and *Biscayne Bay Strategic Access Plan*, and NPS special resource studies, such as those for Miami Circle and Virginia Key Beach Park, have resulted in some long-term beneficial impacts on park operations and facilities. However, these impacts are almost impossible to measure.

This alternative, with its emphasis on strong natural and cultural resource protection while providing a diversity of visitor experiences as well as establishment of potential visitor contact points outside the park, in combination with the aforementioned beneficial impacts of past and ongoing cooperative planning and development projects in the Biscayne Bay region, would generally result in long-term beneficial cumulative impacts on facilities and long-term, negligible, adverse cumulative impacts on park operations. This alternative's contribution to these impacts would be small and beneficial for facilities and small and adverse for park operations.

Conclusion. Actions under alternative 4 would generally result in long-term, minor, adverse impacts on park operations. The overall cumulative impacts would be long term and beneficial for facilities and long term, negligible, and adverse for park operations due to . This alternative's contribution to these impacts would be small and beneficial for facilities and small and adverse for park operations.

SOCIOECONOMIC ENVIRONMENT

Full implementation of this alternative would 14 additional full-time equivalent staff positions to handle the increased workload for interpretation, cultural resource management, natural resource management, law enforcement, administrative support, and maintenance. Actual staffing levels would reflect the availability of adequate budgets. Any additional employment along with federal dollars that would be required to implement

this alternative is expected to have a long-term beneficial impact on the regional economy.

Under this alternative, visitors would continue to have unrestricted access (multiuse zone) to most of the park's waters (approximately 85%) and would be able to engage in a wide range of recreational activities. Adverse impacts now occurring on fishery resources and habitat in the park would be reduced under this alternative due to the additions of slow speed, noncombustion, sensitive resource, and nature observation zones. It has been estimated that Biscayne Bay related recreational activities created $3.8 billion in economic output, $2.1 billion in incomes, and 57,000 jobs (Hazen and Sawyer 2005). However, there are indications that Biscayne Bay is showing a decreased capacity, or resilience, to withstand external pressures which may affect the bay's long-term health, and its environmental and economic sustainability (Adams and Blair 2014).

Proposed zones would help over time to separate conflicting visitor uses, increase boating safety, and increase nonmotorized recreational opportunities. Economic studies beginning with Fisher and Krutilla (1972), Cichetti and Smith (1973, 1976), Prince and Ahmed (1988) have shown that congestion will cause recreationist to adjust their length of visit and satisfaction with their recreation experiences. The expected long-term beneficial impacts on park fishery resources and habitat as well as on some visitors' experiences associated with the implementation of these zones would result in a long-term beneficial impact on the sustainability of local tourism and resource-based economic activities.

The proposed visitor services and facilities improvements would enhance the range and quality of recreational and interpretive opportunities available throughout the park, which has the potential to improve visitors' park experience and satisfaction and possibly increase the number of visitors and average length of park visit. These visitor services and facilities improvements and associated enhanced visitor experience, length of visits, and number of visitors would have a long-term beneficial impact on tourism-related businesses.

Similar to the no-action alternative, the continued presence of Biscayne National Park positively contributes to the value of surrounding private land.

Economic Effects of Marine Reserve Zones

Implementing alternative 4 would result in the creation of a marine reserve zone, which is a no-fishing area. The zone in this alternative would encompass about 6% of the park waters.

There are many marine protected areas around the world, with varying levels of protection for marine habitats and different restrictions on fishing and recreation. Some areas limit fishing entirely (termed "no-take" areas or marine reserves) while allowing recreational use such as boating and scuba diving. Other areas have limitations on fishing by factors such as species, type of gear used, season, or location. Few comprehensive studies have followed the economic effects of marine protected areas because of the associated complex socioeconomic conditions. This, and the variety of protected area designations, makes comparison of economic effects difficult, but some generalizations can be drawn from some of the larger studies that have been carried out.

In the Philippines, a portion of the Sumilon Island, Cebu, was closed to all fishing for 10 years, while swimming and scuba diving were allowed. After that period, fish abundance had increased three-fold, with the most significant increases among the most highly targeted species (White et al. 2002). Additionally, the yearly fish catch to fishers on the same reef but outside the sanctuary more than doubled, from 14 tons per square kilometer to 36 tons per square kilometer (Russ and Alcala 1996, cited in White et al. 2002). Food security,

increased income from tourism, and pride in their protection role were also cited as major benefits of this sanctuary (White et al. 2002). The success of the Sumilon Island sanctuary spurred the creation of numerous other marine protected areas in the Philippines, with similar outcomes. One of the most important results of the Philippines marine protected area program is the leadership by local communities, who are benefiting most from the protected areas. National oversight provides some general consistency among marine protected areas, but local governments and citizens' groups are leading the procedural and creative development of these areas. Benefits include strong increases in citizens' satisfaction with the fishery management, household income, knowledge of fishery resources, allocation of access rights, and overall participation and influence in community affairs (Katon et al. 1999, cited in White et al. 2002).

Leeworthy and Wiley (2003) investigated both qualitative and quantitative effects of the six "no-take" alternatives that were developed for the Channel Islands National Marine Sanctuary. In the context of the entire diverse economy of the study area, which included San Diego, Los Angeles, and Orange Counties, the authors concluded there would be no significant macroeconomic or fiscal effects from the marine reserves. However, they noted that local economies may be impacted, and that there may be significant effects on certain individuals or groups. In the short term, negative effects or costs may impact the commercial fishing industry and the recreational fishing community because of displacement and loss of income, including secondary losses to associated industries. In the long term, however, these groups may realize benefits because the improved health of fishery resources in the marine reserve would lead to improved fish stocks outside the reserve. The authors found that recreational users who engage in scuba diving, sailing, sightseeing, and wildlife viewing would realize benefits from marine reserves, as would the service providers supporting these activities. The authors note that human response—both from the commercial and recreational fishing sectors and by recreational and passive users—is highly adaptive, and that financial losses are not always realized if these groups adapt quickly to the reserve zones (Leeworthy and Wiley 2003).

Although the establishment of a marine reserve zone could result in some short-term, negligible and adverse impacts on local businesses that formerly took visitors out to fish in the marine reserve zone, the expected spillover effect, where fish species could grow larger and therefore increase in reproductive output, would generally contribute to long-term, beneficial impacts on recreational fishing and associated service-related sectors.

Limited commercial fishing currently takes place in the proposed marine reserve zone. Parkwide phase-out of commercial fishing is addressed in the separate and previously described *Fishery Management Plan*. However, the establishment of a marine reserve zone would terminate commercial fishing in this area of the park immediately, after passage of a park special regulation. This would have a localized, negligible adverse impact on commercial fishing as this activity would have to occur elsewhere in or out of the park.

Nonconsumptive recreation benefits currently taking place in the area, such as snorkeling and scuba diving, would continue in the proposed marine reserve zone. Economic studies have shown that snorkelers and divers would increase trips with improvements in fish abundance, water visibility, and coral quality (Bhat 2003), all of which are expected to occur under this alternative. An increase in recreational scuba diving may increase coral reef damage due to a higher frequency of diver-coral contacts (Chadwick-Furman 1997; Krieger and Chadwick 2012). This would be mitigated through an increased ecotourism management strategy to specifically educate divers about the extra care needed when recreating around coral reefs. Therefore, a long-term beneficial

impact would be expected for snorkeling- and scuba diving-related businesses.

Due to a shift in visitation patterns, the net effect in the number of visitors or average length of visit would be expected to be negligible. Therefore, under this alternative, it is expected there would be no effect on tourism-related businesses.

Actions under this alternative are anticipated to provide park coral reefs the greatest opportunity for reef ecosystem recovery and increased reef resiliency. Johns et al. (2003) report that reef-related expenditures in Miami-Dade County generate $614 million in income and sustain 19,000 jobs in Miami-Dade County and generate nearly $4 billion dollars in sales in the southeast Florida region annually. The establishment of a marine reserve zone has the potential to help sustain the current contributions southeast Florida coral reefs provide to the regional socioeconomic environment.

Cumulative Impacts. Impacts associated with past and ongoing partnership and planning efforts, presence of nearby recreational opportunities, and expanded developed area according to city and county plan with its associated population and park visitation increase would be similar to those described under alternative 1.

The actions of this alternative, especially a marine reserve zone and park zoning that could enhance resource conditions, improve access and recreational opportunities and facilities, combined with the ongoing regional efforts, would have the potential to safeguard and improve the sustainability of the local and regional recreational and service-related sectors by ensuring a quality visitor experience and satisfaction, especially related to fishing, nature viewing, and other resource-based recreational activities resulting in a long-term beneficial impact to the regional socioeconomic environment.

The long-term socioeconomic impacts of phasing out commercial fishing in the park are expected to be realized with implementation of the *Fishery Management Plan* and are assessed in that plan. For more information on the *Fishery Management Plan*, please visit http://www.nps.gov/bisc /parkmgmt/fishery-management-plan.htm.

Alternative 4 would contribute a small beneficial increment to the above impacts of other past, present, and future actions on socioeconomic conditions and, when considered in combination with other actions, would result in a beneficial cumulative impact.

Conclusion. The strong protection of natural and cultural resources that is expected to enhance resource conditions would have a long-term beneficial impact to the regional socioeconomic environment. Upgrades in park visitor services and facilities would support regional efforts to enhance tourism and increase visitor access and recreational opportunities in the area. There would be long-term, negligible, adverse impacts to commercial fishing due to the establishment of a marine reserve zone. There would be long-term beneficial impacts would occur to for snorkeling- and scuba diving-related businesses from the continuation of nonconsumptive recreation uses in the marine reserve zone. The expected spillover effect, where fish species could grow larger and therefore increase in reproductive output, would generally contribute to long-term, beneficial impacts on recreational fishing and associated service-related sectors.

The overall cumulative effects would be beneficial with this alternative contributing a small increment.

UNAVOIDABLE MODERATE OR MAJOR ADVERSE IMPACTS

Unavoidable adverse impacts are defined here as impacts that cannot be fully mitigated or avoided. There would be no unavoidable moderate or major adverse impacts expected as a result of implementing alternative 4.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Alternative 4 would have a small potential for some commitments of resources because it would involve a minimum of new development (e.g., trails, primitive dock). However, most of the development being proposed is minimal, such as trails with only small areas of potential impact. Most proposed development would be built in previously disturbed areas, so would not result in irreversible or irretrievable commitments of resources. Cultural resources would continue to be protected through active preservation maintenance.

NATURAL OR DEPLETABLE RESOURCES AND ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

Whenever feasible, the National Park Service strives to maximize the use of renewable resources and energy and therefore minimize the use of depletable resources. However, it is not possible with today's technologies to cost-effectively avoid all use of depletable resources in building and operating facilities.

Implementing alternative 4 would involve minimal increase in energy requirements.

IMPACTS OF IMPLEMENTING ALTERNATIVE 5

NATURAL RESOURCES

Fishery Resources

In the waters of the multiuse zone (water) impacts described in the no-action alternative (alternative 1) would probably persist, although this zone is reduced in size compared to all other alternatives. These impacts include impacts on fishery resources and fish habitat caused by boating and fishing in the park. These impacts would continue to be long term, minor to moderate, and adverse.

Proposed management actions under this alternative would include the most area of fish habitat in protective zones of all the alternatives. Alternative 5 would include a marine reserve zone from Elliott Key east to the park boundary and encompassing Ajax Reef and Long Reef and Hawk Channel (see alternative 5 map). In this 21,884-acre zone, both commercial and recreational fishing would be prohibited as well as the harvest of ornamentals, corals, and sponges. About 27% of the park's hardbottom habitat would be within this zone, and 73% would be available for fishing outside of the marine reserve zone. In this area boat size, type, and speed could be regulated to protect resources. Under this alternative the adverse impacts associated with fishing and other recreational activities would be substantially reduced. Both the number and size of previously fished organisms as well as species richness and diversity would be expected to increase over time within this zone because of decreases in direct mortality, habitat destruction, and indirect ecosystem impacts. The impacts of this alternative on the coral reef and associated fish populations in the bay would be long term and beneficial.

Implementation of the large access-by-permit zone and the number of acres covered by the noncombustion engine use and slow speed zones in the bay would limit the number, type, and speed of boats in these areas. This would reduce existing impacts from boats on important seagrass beds and habitat for juvenile fish in the park. In addition, a 21,884-acre marine reserve zone where fishing is not allowed would be implemented. The access-by-permit zone and marine reserve zone would also reduce the number of people fishing in these areas, therefore reducing fishing pressure in these areas. Even though fishing pressure may increase outside these zones, the anticipated increase in size and abundance of fish within the marine reserve zone is expected to have a spillover effect outside the zone, as documented in other marine reserve zones worldwide. Research has shown that marine reserves deliver a wide range of benefits to conservation, science, and general management. Marine reserves allow not only for the recovery of fish species/stocks, they provide sufficient protection for the ecosystems they encompass (Bohnsack 1996). These actions would result in long-term beneficial impacts on park fishery resources.

With no additional controls on fishery resources in other waters of the park, species in both the bay and the reefs would continue to experience substantial pressures from both commercial and recreational fishing, although if the *Fishery Management Plan* is fully implemented, commercial fishing would be phased out over time. Some fish would continue to be overfished or subject to overfishing. These impacts would continue to be adverse and minor to moderate in the long term.

There could be an increase in the number of people fishing from the shoreline if a new boardwalk was built facing the bay waters. This would be expected to have a long-term, negligible, adverse impact on park fishery resources.

This alternative would provide a greater benefit to fishery resource habitat in the seagrass than alternative 1 because a larger area for seagrass beds in the park would be included in protective zoning designation.

These zones include the noncombustion engine use zone, the slow speed zone, and the marine reserve zone , all of which contain seagrass beds.

Cumulative Impacts. In 2002, the National Park Service and the FWC initiated a fishery management plan and environmental impact statement, which was finalized in 2014.

The *Fishery Management Plan* changes include establishment of a permit system for both recreational boating and commercial fishers, limits on the type of spearfishing equipment that can be used in the park, a moderate decrease in fishery harvests, and elimination of the lobster sport season. With implementation of the *Fishery Management Plan*, the park anticipates the current condition of fishery resource stocks would improve and the impact of fishing on habitat within the park would be reduced. The long-term impacts of the *Fishery Management Plan* on fishery resources in the park would be beneficial. Because proposed management actions under this alternative are more protective of fish habitat than under alternative 1, there would be more benefits on park fishery resources realized from combining actions under this alternative with the implementation of the *Fishery Management Plan* than implementing the fishery management plan alone (as in alternative 1).

The United States Coral Reef Task Force, created in 1998, was established to lead U.S. efforts to protect, restore, and "sustainably" use coral reef ecosystems. These efforts include but are not limited to reducing and mitigating coral reef degradation from pollution, overfishing, and other causes. The task force has identified fundamental themes to guide immediate and sustained national action. These themes include quickly reducing the adverse impacts of human activities on coral reefs and associated ecosystems. This would be a long-term benefit to the ecosystem.

The fishing prohibition in the marine reserve zone, combined with similar prohibitions and/or restrictions in waters outside of the park boundary, could increase fishing pressure and related impacts of overfishing and marine debris in the few reef patches still open to fishing. This could be a long-term, moderate adverse impact to those overfished reefs, but the overall impact to fish populations and fish habitat would be mitigated by the protection of prime reefs which serve as nursery grounds to maintain populations of fish species.

Impacts associated with other past, present, and reasonably foreseeable actions would be the similar to alternative 1. The reduction of adverse impacts from human activities on coral reefs and associated ecosystems, combined with efforts from the United States Coral Reef Task Force, would generally result in beneficial impacts. However, the intensity and duration of the cumulative effect of the above planning efforts would depend on the actual number and type of actions taken to implement the identified fundamental themes.

The expanded developed area according to city and county plans with its associated population increase is expected to continue and could lead to additional fishing pressure on fish populations in the park—a potential long-term adverse impact that would be partially mitigated by actions in the fishery management plan.

This alternative would contribute a beneficial impact to the beneficial impacts of other past, present, and future actions resulting in beneficial cumulative impact.

Conclusion. This alternative would have no new adverse impacts from proposed management actions. Long-term, minor to moderate, adverse impacts now occurring to fishery resources and fish habitat in the park

would persist in some of the park waters. Such impacts would be dramatically reduced in areas of protective zoning, particularly in the marine reserve zone and access-by-permit zone, resulting in a long-term, beneficial impact to fish and fish habitat in some locations. The benefits would be greater than alternative 4, due to the larger marine reserve zone. Research has shown that marine reserve zones deliver a wide range of benefits to science, conservation, and general management. A study of marine reserves in New Zealand, for example, revealed over a 35-year period (1977 to 2012) that marine reserves, when properly managed, provide ecologically valuable representation and replication of habitats and species and can be self-sustaining over time (Ballantine 2014). In addition, marine reserves allow not only for the recovery of fish species/stocks, they provide sufficient protection for the ecosystems they encompass (Bohnsack 1996).

Threatened and Endangered Species

Manatee. Manatees are more likely to be found in the warm waters closest to shore, so there would continue to be a 1,000 foot manatee protection area in the waters nearest the shoreline. In this alternative, the entire 1,000 foot manatee protection area would be designated as a noncombustion engine use zone (poling and trolling only). The expanded zone would increase the area where water-based resources are protected and visitor use impacts are minimized and would further reduce the likelihood of boat-related injuries and mortality of manatees in the park. The slow speed and noncombustion engine use zones under this alternative would result in fewer boat groundings in seagrass beds, an important habitat/food source for manatees.

This alternative would provide greater protection to the manatee and its habitat than in other alternatives. This would have a long-term beneficial impact on manatees and manatee habitat in the park.

Section 7 Determination of Effect— The impacts on the manatee under this alternative would be localized, and beneficial. Measurable beneficial outcomes on individual manatees and the manatee population because of the protective zones are likely. This would equate to a "may affect, not likely to adversely affect" determination.

Sea Turtles. In the waters of the multiuse zone (water), impacts described in the no-action alternative (alternative 1) would be expected to persist. These impacts include potential for collisions with boats, strangulation and entanglement with marine debris (including lobster and crab traps), hook-and-line fishing, and vessel groundings on sea turtle foraging habitat (coral and seagrass), which may adversely affect sea turtles, particularly loggerhead, hawksbill, and green species. Leatherback and Kemp's Ridley would be less likely to be affected because they are rarely in the park. These impacts would continue to be long-term, minor to moderate, and adverse.

Collisions between boats and sea turtles would be expected to be minimized in the slow speed, noncombustion engine use, and access-by-permit zones. However, given the size of these zones compared to the size of the multiuse zone, the beneficial impacts of implementation of this alternative would be minor.

The implementation of a marine reserve zone would result in less derelict fishing gear and commercial lobster trap gear (e.g., monofilament line and traps) in this area, which is known to cause strangulation, entrapment, and fatalities of sea turtles. This would result in the reduction of these threats to sea turtles within this zone. This would be a beneficial, long-term impact on sea turtles. This beneficial impact would be offset if fishing pressure increased outside the marine reserve zone.

Studies in Florida and other areas in the world have shown that artificial light adversely impacts sea turtle nesting. Light on Elliott Key

is primarily generated from park service facilities, campground, and visitor harbor, all located on the bay side of the island. This light does not reach the nesting beaches, which are on the ocean side of the island. Any light generated by campers in the group campsite, located on the ocean side of Elliott Key, would be minimal and unlikely to reach sea turtle nesting beaches. There would be no new development on Boca Chita Key. Because the number of visitors to Boca Chita would not likely change; current turtle management efforts could be sufficient. There would be no adverse impact of development on Boca Chita on nesting sea turtles. The current level of development on Elliott Key would continue in the harbor facilities, and there would be no trail improvement under this alternative. Continuation of current management of turtle nesting areas would likely be adequate.

Section 7 Determination of Effect— Impacts to sea turtles from fishing and boating would persist in most of the park, resulting in a determination of "may affect, likely to adversely affect" for loggerhead, hawksbill, and green species that frequent the park waters.

American Crocodile. Visitor services and infrastructure would remain at or near current levels with the boardwalk and jetty in the vicinity of Convoy Point. This area is north of the designated critical habitat area for the crocodiles where few crocodiles are seen and would not be expected to impact their activities in the park. The mangrove wetland south of the visitor center would continue be managed primarily to protect the habitat characteristics of the area. No additional development within the designated critical habitat would be proposed under this alternative. The impacts of activities on crocodile habitat and activities along the mainland shore would be adverse but negligible for this alternative.

Under this alternative, there would be no new development on Porgy Key. The noncombustion engine use zone would be expanded to include the eastern shoreline of Old Rhodes Key and south to include the waters around Swan Key and Broad Creek. Without the park administrative presence, there would not be the opportunity to orient visitors to the waters around the southern keys and include a discussion of crocodiles and their habitat. However, because of the noncombustion engine use zone and the lack of visitor facilities, visitation would likely be low in this area. Even if population pressures along the mainland encourage crocodiles to venture across the bay, the interaction between crocodiles and visitors would be low. The impact of this alternative on crocodiles in this area of the designated critical habitat would be adverse but negligible in the long term.

If populations of crocodiles were to increase within the park, there could be increased interaction between visitors and crocodiles. The developed area at Adams Key provides an excellent opportunity to orient visitors to designated critical habitat for crocodiles, including appropriate actions when traveling in crocodile habitat. With mitigation, the long-term adverse impact of this alternative on the crocodile population in this area of the park would be negligible.

As a whole, the park protects habitat for the crocodile and serves to further its conservation through education and law enforcement, resulting in long-term beneficial impacts to this species.

Section 7 Determination of Effect— The impacts on the American crocodile under this alternative would be negligible and adverse, localized, and beneficial. Mitigation measures would be put in place in the event of more visitor-crocodile interactions. Overall, this would equate to a "may affect, not likely to adversely affect" determination for the American crocodile.

Smalltooth Sawfish. In the waters of the multiuse zone (water), impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include potential for bycatch, which could occur with

any continuation of hook-and-line fishing efforts as well as potential for entanglement in marine debris such as fishing line and nets. These impacts would continue to be adverse, minor to moderate, and long term, although realizing such effects is unlikely given the rarity of smalltooth sawfish in the park.

As in other alternatives, smalltooth sawfish could be affected by any increase in hook-and-line fishing efforts, although any effects are unlikely given the rarity of smalltooth sawfish in the national park.

The establishment of the marine reserve zone, which would extend from the ocean side of Elliott Key out to deeper reef habitat may have a positive effect on smalltooth sawfish by reducing bycatch of the species across a variety of habitats where the fish may possibly occur. However, given the rarity of this species in park waters, any beneficial impacts are likely to remain insubstantial, as with other alternatives. No other actions that would occur under this alternative would be expected to affect sawfish in the park.

Section 7 Determination of Effect— Existing impacts from fishing would persist in much of the park and may be locally reduced in some relatively large areas locations zoned for increased resource protection. The section 7 effect determination would be "may affect, likely to adversely affect" for smalltooth sawfish under alternative 5.

Schaus Swallowtail Butterfly and Miami Blue Butterfly. The impacts on the butterfly population and habitat would be the same as in the no-action alternative because likely no new development would occur on Adams Key and the trail through the hardwood hammock on Elliott Key would not be hardened. Old Rhodes and Totten Keys would continue to be zones for nature observation, and Swan Key would be zoned as a sensitive resource area. Impacts on the hardwood hammocks on these keys are currently minimal and would not be expected to change under this alternative. The long-term adverse impacts on butterfly populations and habitat would be negligible under this alternative.

Continued protection of butterfly habitat on these keys would generally be a beneficial impact to these butterfly species.

Section 7 Determination of Effect— The impacts on the Schaus swallowtail butterfly and Miami blue butterfly under this alternative would be adverse but negligible. Mitigating measures to protect the species' habitat and breeding season would likely be successful. Overall, this alternative would result in the determination of "may affect, not likely to adversely affect" the Schaus swallowtail butterfly.

Stony Corals. In the waters of the multiuse zone (water) impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include the potential for ecological and physical stress to corals from overfishing, fishing debris, anchoring, and/or vessel groundings associated with existing boating and fishing activities. Such impacts are long-term, moderate, and adverse to stony corals and their habitat.

Under this alternative, Legare Anchorage would be reduced in size, although it would continue to be closed to in-water activities and would provide protection to stony corals that may be in this area.

The creation of a large (21,884 acres) marine reserve zone would prohibit commercial and recreational fishing and anchoring on many of the southern reefs in the park, which includes areas known to support healthy populations of stony corals, as well as in seagrass and hardbottom habitats west of these reefs. Because visitors who would otherwise use the area in the marine reserve zone to fish would have to fish elsewhere, boat traffic and anchoring throughout this zone could be expected to decrease. Some of these decreases would be offset by an anticipated increased use of the zone by snorkelers and scuba divers. Because the marine reserve zone is

expected to reduce fishing and improve ecological balance, reduce fishing debris, reduce vessel groundings, and reduce damage from inappropriate anchoring in stony coral habitat, actions under alternative 5 are expected to have a long-term, beneficial impact. While the nonextractive in-water activities of snorkelers and scuba divers would pose an increased risk of abrasion of corals and/or sedimentation from accidental touching, kicking, and stepping, these impacts could be mitigated by education and would be on a much smaller scale than the impacts of discarded and improperly used fishing gear currently occurring in the area, and by the beneficial impacts of implementation of the marine reserve zone.

It is anticipated that commercial fishing would be eventually phased out parkwide as provided for in the *Fishery Management Plan* (2014); however, implementation of a marine reserve zone would prohibit all commercial fishing in this zone after passage of a park special regulation. This locally reduced fishing pressure, where targeted fish species could grow larger and therefore increase in reproductive output, would result in a long-term very beneficial impact on the stony coral habitat.

The addition of or relocation of mooring buoys and boundary markers would result in short-term, negligible to minor adverse impacts in specific areas associated with underwater installation and associated impacts to submerged substrates, although every effort would be made to install in locations away from corals, seagrass beds, and submerged cultural resources. Increased public outreach and/or law enforcement efforts would probably reduce the potential for illegal anchoring that could impact stony corals.

The use and maintenance of navigational markers and mooring buoys would continue to minimize impacts to stony corals from unintentional vessel and anchor damage.

Visitors that would otherwise use the area in the zone to fish would have to fish elsewhere, so boat traffic and anchoring throughout this zone could be expected to decrease. Although unlikely, this decrease could be offset if there is an increase in people using the marine reserve zone for nonextractive activities such as snorkeling and scuba diving. Because the marine reserve zone is expected to reduce fishing and improve ecological balance, reduce fishing debris, reduce vessel groundings, and reduce damage from inappropriate anchoring in stony coral habitat, actions under alternative 5 would be expected to have a beneficial effect on stony corals.

Section 7 Determination of Effect— Existing boating, fishing, and marine debris impacts would persist in much of the park waters and continue to impact stony corals and their habitat. The marine reserve zone is expected to have a beneficial long-term effect on stony corals within that area by protecting them from activities that could lead to physical and ecological damage, thus reducing but not eliminating the adverse effects parkwide. Thus, this alternative would result in a determination of "may affect, likely to adversely affect" on stony corals.

Cumulative Impacts. Habitat disturbance or loss is the most common reason for a species to be listed. The establishment of Biscayne National Park has provided a protective refuge for listed species resulting in long-term beneficial impacts.

The *Florida Manatee Recovery Plan* and the site specific county plans are designed in part to reduce boat-related manatee injury and mortality as well as protect habitat areas. These measures are consistent with protection measures incorporated into the proposed actions in this general management plan. Implementation of this recovery plan would continue to have a beneficial impact on manatee protection efforts in the park. The efforts to protect the manatee would be strengthened under this alternative with the addition of a noncombustion engine use zone

in the 500 feet closest to the mainland shoreline. The impacts of these changes would continue to have a beneficial impact on manatee protection efforts.

Reintroduction efforts of Miami blue butterflies have occurred on Elliott Key in an attempt to restore this species. If successful, this would be a long-term beneficial impact. The monitoring and recovery plan would continue to be implemented.

Alternative 5 would result in negligible adverse and beneficial impacts on federally listed species. When combined with the impacts of other past, present, and future actions, the overall cumulative effect would be negligible and beneficial. This alternative would have a small contribution to the overall cumulative effects.

Conclusion. This alternative would have no new adverse impacts to federally listed species from proposed management actions. Existing impacts to listed species (e.g., manatees, crocodiles, and butterflies) and their habitat would persist in much of the park, particularly in the multiuse zone. Existing long-term, moderate adverse impacts on some species (sea turtles, smalltooth sawfish, and stony corals) would continue in some areas as a result of recreational activities. Some impacts would be reduced through changes in zoning which would be expected to have localized beneficial impacts, most notably the stony corals and other marine species in the marine reserve zone. The park would continue to coordinate with the U.S. Fish and Wildlife Service and NOAA Fisheries and work to mitigate any potential adverse impacts on these species. Thus, the determination would be that this alternative may affect, but is unlikely to adversely affect, listed species in the park. Taking action in this alternative to protect reefs from other pressures such as overfishing and physical damage from fishing gear, anchoring, and vessel groundings might also increase reef resiliency, potentially delaying the effects of global-scale stressors such as climate change, ocean acidification, and land-based sources of pollution (Jackson 214). This is expected to result in beneficial impacts for stony corals and the listed species that depend on reef habitats such as sea turtles.

Cumulative effects would beneficial. This alternative would have a small contribution to the overall cumulative effects.

Special Status Species, Including State Listed Species

Birds. Arsenicker Key and West Arsenicker Key host wading bird colonies including state listed wading birds and state listed white-crowned pigeons, and West Arsenicker also hosts nesting bald eagles. These keys would be zoned sensitive resource zones and would remain closed. The impacts on the state listed wading birds, state listed white-crowned pigeons, and bald eagles would not change from current conditions. Furthermore, the creation of a noncombustion engine use zone extending 500 feet from the sensitive resource zone around West Arsenicker and Arsenicker Keys would further reduce the likelihood of disturbances to bald eagles or any state listed birds using these islands.

Under this alternative, the waters east of Cutter Bank Shallows extending into and south of Jones Lagoon would be designated a noncombustion engine use zone. Visitation would be allowed within the islands around Jones Lagoon, so there would be some human-caused intrusions to birds nesting, roosting, loafing, and/or foraging there; however, resource protection would be emphasized. Actions under alternative 5 would reduce, although not eliminate, the potential for disturbance to birds using the Jones Lagoon area because there is still the possibility that small vessels (e.g., paddlecraft) and people coming ashore could closely approach birds. Given that visitation to Jones Lagoon would be expected to remain minimal, adverse impacts on the birds and their habitat would be minor in these areas. If visitation increases such that any state listed birds could be disturbed, management actions

could include limiting access to areas where birds are known to nest during nesting season and/or establishing set-back distances following recommendations in scientific literature. Under this alternative, the long-term adverse impact on the state listed bird populations in the park and potential nesting activity in the Jones Lagoon area would be negligible.

Under this alternative, birds using coastal habitats along the park's mainland shoreline would be protected from potential boat-related disturbances from a noncombustion engine use zone that extends 1,000 feet east of the mainland (excluding Black Point, Convoy Point, and Turkey Point Channels). By limiting the use of the waters immediately adjacent to the mainland shoreline, this zone would be expected to reduce potential boat-related disturbances (e.g., loud engines frightening a bird off its nest) to roosting, nesting, foraging, and/or loafing birds in the area.

Overall, under this alternative, including any necessary mitigation, the long-term adverse impact on state listed bird populations and nesting activity in the park would be negligible. Alternative 5 would result in beneficial impacts on state listed bird populations and nesting activity in the park due to the establishment of protective zones around the above mentioned keys.

Cumulative Impacts. These species were listed because the adverse impacts of habitat disturbance or loss resulted in declines in population numbers. The establishment of Biscayne National Park has provided increased protection of habitat for state listed birds, and butterflies in the park, which is a long-term beneficial impact.

Alternative 5 would result in negligible adverse impacts on state listed bird species due to visitor activities. When combined with the impacts of other past, present, and future actions, the overall cumulative effect would be beneficial. This alternative would slightly reduce the overall beneficial cumulative effects.

Conclusion. Implementing alternative 5 would result in long-term, negligible, adverse impacts on state listed birds and would not be likely to lead to federal listing. There would be beneficial impacts to state listed birds through protective zoning which would reduce the likelihood of disturbance in important bird habitats caused by visitor activities.

Terrestrial Vegetation

This alternative would have little adverse impact on terrestrial vegetation because of the low level of proposed development on the mainland and keys. There would be no new development of visitor services on Porgy Key, and visitation to the Jones homesite would not be encouraged. Although there could still be some continued adverse impacts on Porgy Key associated with visitation, such as trampling and social trails, these impacts would be slight because visitation would be low. Thus, impacts on vegetation on Porgy Key would be adverse but negligible in the long term.

The adverse impacts on vegetation associated with visitation at Boca Chita and Adams Keys would be minor. The adverse impacts could include trampling of vegetation and social trails. In general, these impacts could be mitigated by visitor education efforts and trail design to keep visitors on the existing trails. With mitigation measures in place, the adverse impacts of continued visitation would be negligible in the long term.

The trail on Elliott Key would remain as it is today, and no primitive campgrounds or hardened access trails would be developed. There would continue to be some adverse impacts associated with visitation, but they would be negligible.

Under this alternative, the mainland shoreline, Sands Key, and the islands surrounding Jones Lagoon would be zoned as nature observation

zones and visitation would be allowed, however protection would be emphasized. This expected to have a long-term beneficial impact on terrestrial vegetation on these islands.

Cumulative Impacts. Creation of Biscayne National Park has resulted in long-term benefits to terrestrial vegetation by maintaining some undeveloped areas.

An exotic plant management plan has been developed for Biscayne National Park and eight other national parks in the region. Exotic invasive plant species can change the structure and function of native plant communities. These changes can have an adverse impact on habitat for native species that rely on the native plant communities. Vegetation disturbances caused by social trails and trampling of native vegetation encourages growth of invasive species. Removal of nonnative species would provide better conditions to reestablish native vegetation in disturbed areas, which could help mitigate the adverse impacts associated with social trails in the park. Implementation of this plant management plan would have a beneficial impact on terrestrial vegetation in the park and the habitat it provides.

When the negligible adverse impacts of alternative 5 are combined with the beneficial impacts of other past, present, and future actions in the park, the resulting cumulative impacts would be beneficial. This alternative would slightly reduce these beneficial cumulative impacts.

Conclusion. Implementing this alternative would result in long-term, negligible, adverse impacts on native terrestrial vegetation primarily associated with existing facilities and ongoing visitor use. Beneficial impacts would continue due to ongoing resource stewardship of terrestrial vegetation. There would be no new adverse impacts as there would be no trail improvements under this alternative.

Wetlands

Wetlands in the park would continue to serve as an important habitat area for a wide variety of terrestrial and aquatic species in the park. Placement of the nature observation zone along the mainland would give greater protection to mangrove shorelines. This would have long-term, minor, and beneficial impacts.

No additional access into the mangroves that fringe the keys would be developed under this alternative, so there would be no change in the current size, integrity, or continuity of the wetland areas in the park. However, placement of the nature observation zone along almost all the mainland would give greater protection to mangrove shorelines. This would have beneficial, long-term impacts.

Cumulative Impacts. The Biscayne Bay Coastal Wetlands Project of the *Comprehensive Everglades Restoration Plan* includes pump stations, spreader swales, stormwater treatment areas, flow ways, levees, culverts, and backfilled canals in southeast Miami-Dade County and covers 13,600 acres from the Deering Estate south to the Turkey Point Power Plant. The purpose of this project is to rehydrate wetlands and reduce point source discharge to Biscayne Bay. The proposed project will replace lost overland flow and partially compensate for the reduction in groundwater seepage by redistributing, through a spreader system, available surface water entering the area from regional canals. The proposed redistribution of freshwater flow across a broad front is expected to restore or enhance freshwater wetlands, tidal wetlands, and nearshore bay habitat. Sustained lower-than-seawater salinities are required in tidal wetlands and the nearshore bay to provide nursery habitat for fish and shellfish. This project is expected to create conditions that would be conducive to the reestablishment of oysters and other components of the oyster reef community.

Diversion of canal discharges into coastal wetlands is expected not only to reestablish productive nursery habitat along the shoreline but also to reduce the abrupt freshwater discharges that are physiologically stressful to fish and benthic invertebrates in the bay near canal outlets. The impact of these actions once implemented would be beneficial for wetlands inside and outside the park. The actions proposed in the Biscayne Bay Coastal Wetlands Project could improve the overall health of the wetland areas along the mainland shoreline such that the system as a whole is better able to accommodate the stresses associated with the short- and long-term impacts of the development and human use in the area.

The actions proposed in the Biscayne Bay Coastal Wetlands Project could improve the overall health of wetland areas along the mainland shoreline such that the system as a whole is better able to accommodate the stresses associated with the short- and long-term impacts of the development and human use in the area.

This alternative would have a slight beneficial contribution to the beneficial impacts of other present and future actions, resulting in beneficial cumulative impacts.

Conclusion. There would be beneficial, long-term impacts to wetlands as a result of protective zoning.

Submerged Aquatic Communities

In the waters of the multiuse zone impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include impacts on submerged aquatic communities caused by boating and fishing and associated marine debris. These impacts would continue to be long term, minor to moderate, and adverse.

This alternative would provide the greatest protection to submerged aquatic communities in the park, particularly seagrass beds. The proposed no-take marine reserve zone is also expected to protect seagrass beds within zone boundaries, from the addition of mooring buoys. The entire 1,000-foot buffer area along the mainland shoreline of the park would also be designated a noncombustion engine use zone. The size of this zone around Totten Key would also include Cutter Bank Shallows to Rubicon Keys in this alternative. Large areas of seagrass and hardbottom communities would receive protection from boat scarring and changes in water quality associated with increased turbidity under this alternative. The long-term impact of the large noncombustion engine use zone and the addition of a marine reserve zone on these communities would be beneficial.

The western shoreline of Elliott Key and the waters north of Stiltsville would be designated as a slow speed zone. The type of boats in this area would be limited because boats that need to travel and a high rate of speed would be precluded from entering these areas, consequently the number of boats in these areas is expected to be fewer under this alternative. In addition, the slow speed zone would reduce the potential for scarring in the seagrass beds as well as the potential for turbidity in the water column from high-speed boats, thus minimizing adverse impacts on the productivity of this habitat and water quality in the area. This would be a long-term, beneficial impact.

The waters in the northwest part of the park would be zoned for access-by-permit only. In this zone the number of vessels as well as vessel type and size could be controlled to protect natural resources in the park such as seagrass beds. With fewer vessels in the area the potential for scarring of the seagrass beds and turbidity in the water column from boating would be reduced.

The productivity of the seagrass beds would be expected to increase under this alternative because of the large slow speed zones as well as the inclusion of the areas accessible only by permit. The increase in productivity in the seagrass beds would be a long-term beneficial

impact. Impacts from fishing and anchoring would continue outside the marine reserve zone.

Under this alternative, a marine reserve zone would be designated from Long Reef to the Pacific Reef Lighthouse and west toward the eastern shoreline of Elliott Key. The marine reserve zone would be managed to protect resources. Both commercial and recreational fishing would be prohibited in this zone, as well as the harvest of ornamentals, corals, and sponges. In this zone, boat size, type, and speed could be regulated to protect resources. Under this alternative, the adverse impacts associated with fishing and other recreational activities would be substantially reduced and could potentially increase the resiliency of the reefs within this zone to external pressures such as marine debris, pollution, climate change, ocean acidification, and coral bleaching (Mumby et al. 2013). Both the number and size of previously fished organisms as well as species richness and diversity would be expected to increase over time within the marine reserve zone because of decreases in mortality, habitat destruction, and indirect ecosystem impacts. Additionally, the entire life cycle of commercially and recreationally important fish species, such as the snapper and grouper species, would be protected because the zone would cover both the mangrove nursery habitat and the adult habitat in the reefs. The impacts caused by likely increases in scuba diving activities would be the same as those described in alternative 3. The beneficial impacts of this alternative on the coral reef in the marine reserve zone would be long term and minor to moderate.

It is anticipated that commercial fishing would be phased out parkwide as provided for in the *Fishery Management Plan* (2014); however, implementation of a marine reserve zone would prohibit commercial and recreational fishing in this zone after passage of a park special regulation. This locally reduced fishing pressure, where targeted fish species could grow larger and therefore increase in reproductive output, would result in a long-term beneficial impact on submerged aquatic habitats.

The addition or relocation of mooring buoys and boundary markers would result in short-term, minor adverse impacts in specific areas associated with underwater installations and associated impacts to submerged substrates, although mooring buoys and boundary markers would be placed away from corals, seagrass beds, and submerged cultural resources. Increased public outreach and/or law enforcement efforts would probably reduce the potential for illegal anchoring that could impact submerged aquatic communities and thus is a beneficial impact.

Overall, the health of the seagrass beds would be expected to increase under this alternative because of the increased areas zoned for slow speed and noncombustion engine use and the addition of a marine reserve zone. The increased health of seagrass beds would have a long-term beneficial impact.

Cumulative Impacts. Boat groundings and anchoring have damaged seagrass beds, coral reefs, and hardbottom communities, and degraded habitat for fish, shrimp, crabs, lobsters, and other invertebrates that inhabit these areas.

Coral reefs are complex ecosystems and sensitive to disturbances. Fishing, snorkeling, and scuba diving can also have adverse impacts on coral reef systems. The damage caused by these activities includes scarring from boat propellers and inadvertent placement of anchors, as well as breakage caused by snorkeling and scuba diving. Fishing gear and debris can break, smother, and entangle benthic resources on coral reefs and in seagrass meadows. Fishing also results in removal of predators and the removal of herbivorous fish that keep algae minimized (contributes to reef health). Damage to the coral reefs also adversely impacts other species that rely on the reefs for food and shelter. Damage to the seagrass beds, hardbottom communities, and coral reefs

would continue to be a long term, minor to moderate, and adverse impact.

Alternative 5 would result in long-term beneficial impacts. When combined with the adverse impacts of other past, present, and future actions, the cumulative impacts would be minor and adverse. The contribution of this alternative would be small and slightly reduce the adverse cumulative impacts.

Conclusion. Alternative 5 would result in long-term, minor to moderate adverse impacts to seagrass beds and corals in much of the park zoned for multiuse due to ongoing boating and fishing activities, and marine debris. However, in areas zoned for resource protection, including the marine reserve zone, there would be long-term, beneficial impacts on submerged aquatic communities. Benefits would be greater in alternative 5 due to the larger marine reserve zone than alternatives 3 and 4.

Soundscapes

In the waters of the multiuse zone impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include short-term, minor to moderate adverse impacts caused by boat noise on the water as well as short-term negligible adverse impacts caused by vehicles and routine maintenance equipment on land. In both cases, these noises can transcend the zone in which they originate and be heard in adjacent zones.

Natural soundscapes predominate in the distant portions of the park, away from popular boating routes. Increases in visitation on weekends and during special events add to the number of boats on the bay at one time. Increased boating from a generally increasing human population as provided in county and city plans would be expected to result in increased boat engine noise. Impacts associated with an increased number of boats in the park would be short term, minor to moderate, and adverse.

Under alternative 5, there would be large areas of the bay zoned for permit only, slow speed, or noncombustion engine use. Because these restrictions would reduce the level and duration of noise from boats, there would be long-term, beneficial impacts on soundscapes on portions of the bay and adjacent land.

There would be little new construction in this alternative; this construction would result in short-term, localized, adverse impacts that would be negligible in intensity because it would be localized and occur in the visitor services / park administration zone where noise is better tolerated.

Existing natural soundscapes in the interior of the larger keys would continue to be preserved by protective zoning and relatively low visitor use—a continuing beneficial impact.

Cumulative Impacts. The expanded developed area according to city and county plans with its associated population increase is expected to continue and would be expected to result in increased boating and boat engine noise.

The beneficial and adverse impacts of this alternative, in combination with the adverse impacts of other actions, would result in minor and adverse cumulative impacts on the natural soundscape; however, the contribution of this alternative to these impacts would be a slight reduction of these adverse cumulative impacts.

The beneficial impacts of this alternative, in combination with the adverse impacts of other actions, would result in negligible and adverse cumulative impacts on the natural soundscape. This alternative would modestly reduce these cumulative impacts.

Conclusion. Implementing alternative 5 would have long-term beneficial impacts on soundscapes due to protective zoning. Short-term negligible to minor, adverse impacts during construction and existing minor to moderate adverse impacts on natural

soundscapes would continue as a result of persistent boat-related noise in much of the park. Existing negligible, short-term adverse impacts on natural soundscapes would continue as a result of routine park operations and maintenance activities.

CULTURAL RESOURCES

Archeological Resources (including submerged archeological)

Implementation of this alternative would generally have similar impacts on archeological (including submerged archeological) resources as those listed in alternative 1. The emphasis on natural resource preservation, as well as protection of significant cultural resources, could be expected to have some additional long-term, beneficial impacts on archeological sites. Under this alternative management actions designed to protect sensitive park resources, such as limiting numbers of visitors, means of access, and types of activities in some areas; closing other areas to visitors; and limiting the built environment to basic visitor safety and services in geographically concentrated areas or outside the park boundaries would generally contribute to beneficial impacts on archeological resources. The exclusion of visitors from Arsenicker Key and its surrounding waters, West Arsenicker Key and its surrounding waters, and Sands Key would generally contribute to beneficial impacts on potential and known terrestrial and submerged archeological sites. Further benefits would be realized from the elimination of recreational and commercial fishing (including trawling and traps) in the marine reserve zone that would protect submerged archeological resources.

Reduction of Legare Anchorage to about 1 square mile would continue to afford protection to sensitive underwater archeological resources in the Offshore Reefs Archeological District. Better navigational markings and more logical coordinate-based designation of the protected zone might result in improved public compliance with the regulations in Legare Anchorage, and closure of Legare Anchorage to commercial trapping would reduce resource damage from snagged gear. These steps could be expected to provide additional protection that would result in a long-term and localized beneficial impact on archeological resources.

The addition of or relocation of mooring buoys and boundary markers would result in long-term beneficial impacts to submerged cultural resources, as they would provide protection to sites from the threat of anchor damage. With increased public outreach and/or law enforcement efforts reducing the potential for illegal anchoring, these long-term benefits would be enhanced. The installation of mooring buoys in conjunction with no anchoring zones would also result in long-term beneficial impacts to submerged cultural resources sensitive to visitation pressure by providing a means of controlling visitor carrying capacity at the sites.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. As described above, implementation of alternative 5 would result in negligible to minor adverse and beneficial impacts. The impacts of alternative 5, in combination with negligible to minor adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a negligible to minor adverse cumulative impact. The adverse impacts of alternative 5, however, would be a small component of the adverse cumulative impact.

Conclusion. Implementation of this alternative would have increased beneficial impacts on archeological resources than those listed under alternative 1. Implementation of this alternative would have beneficial impacts on archeological resources because of the potential for reduced anchor damage and decreased visitation pressures on some submerged archeological resources. The emphasis on natural resource preservation, as

well as protection of significant cultural resources, could be expected to have some additional long-term beneficial impacts on archeological sites. Actions under this alternative would have a cumulative beneficial impact on archeological resources.

Section 106 Summary. The implementation of this alternative could include some minor adverse impacts on archeological resources. If impacts remain minor there would be no adverse effects under section 106. Any adverse impacts resulting from moderate or major impacts would be mitigated through the use of *The Secretary of the Interior's Standards and Guidelines for Documentation and Treatment of Historic Properties* and a memorandum of agreement with the state historic preservation officer and Advisory Council to counteract such adverse effects.

Historic Structures and Buildings

Implementation of this alternative would generally have the same impacts on historic structures and buildings in the Boca Chita Key Historic District as those listed under alternative 1. Structures and buildings would be rehabilitated, preserved, and adaptively used in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. However, some minor elements of historic fabric could be lost as a result of remodeling/ rehabilitation efforts, and anticipated increasing visitation levels could result in loss of some historic fabric from inadvertent visitor use or vandalism. As with alternative 1, impacts on historic structures and buildings would be localized, long-term to permanent, and generally beneficial.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be the same as described under alternative 1. As described above, implementation of alternative 5 would result in negligible to minor adverse impacts and beneficial impacts. The impacts of alternative 5, in combination with negligible to minor adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a negligible to minor cumulative impact. The adverse impacts of alternative 5, however, would be a small component of the adverse cumulative impact.

Conclusion. Implementation of this alternative would generally have the same impacts on historic structures and buildings in the Boca Chita Key Historic District as those listed under alternative 1 because they would be rehabilitated, preserved, and interpreted by the National Park Service in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*.

Section 106 Summary. The implementation of this alternative could include some minor adverse impacts on historic structures and buildings. If impacts remain minor there would be no adverse effects under section 106. Any adverse impacts resulting from moderate or major impacts would be mitigated through use of *The Secretary of the Interior's Standards and Guidelines for Documentation and Treatment of Historic Properties* and a memorandum of agreement with the state historic preservation office and the Advisory Council on Historic Preservation to counteract such adverse effects.

Cultural Landscapes

Implementation of this alternative would generally have similar impacts on cultural landscapes in the park as those listed under alternative 1 because potential landscapes would continue to be surveyed, inventoried, and evaluated under National Register of Historic Places criteria. The National Park Service would implement resource management policies that preserve the natural resources and culturally significant character-defining patterns and features of Boca Chita Key as well as other listed, or determined eligible, landscapes in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties With*

Guidelines for the Treatment of Cultural Landscapes.

Additionally, actions under this alternative would emphasize natural resource preservation, as well as protection of significant cultural resources, to protect sensitive resources. These actions, which would include limiting numbers of visitors, means of access, and types of activities in some areas; closing other areas to visitors; and limiting the built environment to basic visitor safety and services in geographically concentrated areas or outside the park boundaries would contribute to long-term, beneficial impacts on the park's potential cultural landscapes.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. As described above, implementation of alternative 5 would result in negligible to minor adverse impacts and beneficial impacts. The impacts of alternative 5, in combination with negligible to minor adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a negligible to minor cumulative impact. The adverse impacts of alternative 5, however, would be a small component of the adverse cumulative impact.

Conclusion. Implementation of this alternative would have similar impacts on the park's cultural landscapes as those listed under alternative 1. The emphasis on natural resource preservation, as well as protection of significant cultural resources, could be expected to have some additional long-term, beneficial impacts on cultural landscapes. Actions under this alternative would have similar cumulative impacts on cultural landscapes as those listed under alternative 1.

Section 106 Summary. The implementation of this alternative could include some minor adverse impacts on cultural landscapes. If impacts remain minor there would be no adverse effects under section 106. Any adverse impacts resulting from moderate or major impacts would be mitigated through the use of *The Secretary of the Interior's Standards and Guidelines for Documentation and Treatment of Cultural Landscapes* and a memorandum of agreement with the state historic preservation office and the Advisory Council on Historic Preservation to counteract such adverse effects.

VISITOR EXPERIENCE

Diversity of Visitor Activities

Under this alternative, visitors would continue to have unrestricted access (as described in the multiuse zone [water]) to approximately 72% of the park's waters to participate in a wide range of recreational opportunities. The remaining 28% of the park would have some restrictions or changes (existing and new) that would potentially enhance, modify, limit, or prohibit visitor access and activities.

This alternative does not provide for transportation to Adams Key, thereby limiting how many people could reach the more remote keys.

This alternative would add a slow speed zone to Caesar Creek and the entire west side of Elliott Key, including Sands Cut. Another slow speed zone would be north of Stiltsville to the park boundary. These slow speed areas would help visitors focus attention on these relatively shallow, sensitive, and sometimes busy areas of the bay. Some visitors would have boats with too deep a draft to be able to operate successfully at slow speeds in these areas and would be excluded from access. For some visitors this change would be perceived as a long-term, adverse, impact on their visitor experience while boating in the park. For other visitors, these reduced speeds would enhance their safety and opportunities for activities like swimming, wading, and fishing. The total area of park waters that would have slow speed restrictions would be about 5% (not including dredged channels that may have speed limits).

The noncombustion engine use zone would include four areas that generally are shallow, where caution is needed, and where different visitor experiences are available. These include West, Middle, and East Featherbed Banks on either side of the Intracoastal Waterway west of Boca Chita Key; the waters within 1,000 feet of the mainland; the waters encircling West Arsenicker and Arsenicker Keys' sensitive resource zone; and the waters surrounding the southern keys, including Old Rhodes Key, Jones Lagoon, and Cutter Bank Shallows. For some visitors this change would be perceived as a long-term, minor, adverse impact on their visitor experience while boating in the park. Also, some visitors would have boats with too deep a draft to be able to operate successfully at slow speeds in these areas and would be excluded from access. This zoning would potentially have a positive impact on the experience of some visitors who currently use or would like to use these areas of the park to explore the mangrove coastline and more remote key environments in paddlecraft. Prohibiting combustion engines would enhance visitor's abilities to more successfully see wildlife and experience the natural sounds of the marine environments as well as increase the likelihood that some visitors would be able to achieve a sense of solitude and tranquility. Also, boaters would have less likelihood of grounding in this zone, and flats anglers would have improved conditions for successful catches. This noncombustion engine use zone would affect about 2.5% of park waters.

Under this alternative, Legare Anchorage would be rezoned and reduced in size relative to current conditions. This would result in visitors having access to an additional 1,700 acres of reef waters being in the multiuse zone and allowing a full range of recreational activities. The sensitive underwater archeological zone, which would be applied to a small area for the Legare Anchorage area, would allow for limited visitor access, which is currently the case. The addition of 1,700 acres to the multiuse zone would provide visitors enhanced opportunities for access and recreation, which would be a long-term beneficial impact on visitors' abilities to access and recreate in park waters.

The access-by-permit zone would affect about 10,081 acres of park waters (about 5.8%). A large area of bay waters in the northwest quadrant of the park would be in this zone. Visitors currently have unlimited access to this area. Adding this permitting requirement would be perceived by some visitors who have previously used these areas of the park without restriction as a long-term, minor, adverse impact on their visitor experience. However, for other visitors this access-by-permit opportunity would likely become increasingly valuable as park visitation levels increase because it would allow visitors to have a relatively secluded or at least uncrowded visit of certain areas of the park with limited competing noise or activity from other groups. This would be a long-term beneficial impact on visitor access and opportunities for a range of visitor activities.

The continued closure to visitors of West Arsenicker and Arsenicker Keys would not change. What would change under this alternative is the application of the sensitive resource zone 500 feet out from the keys' shorelines and a noncombustion engine use zone 500 feet out from the sensitive resource zone. This would be an increase from the current 200-foot closure. Also, Swan Key, Totten Key, and the south half of Sands Key would be closed to visitors. This area is currently lightly used because of limited accessibility; however, visitors who are used to having unrestricted access might find this closure to be a minor adverse impact on their ability to experience the area.

All of the mainland and most of the keys would be zoned for nature observation. Although the full range of recreational activities would be allowed, the relative inaccessibility of the mangrove forests and tropical hardwood hammocks naturally limits activities. Most visitors to these areas would likely experience few interactions with others and would have opportunities to explore, observe nature, and find solitude.

The marine reserve zone in this alternative would set aside a portion of the park's waters from consumptive activities. It is intended to offer visitors unparalleled recreational experiences, including the opportunity to experience an intact, unfished coral reef. Marine scientists throughout the world have found that marine reserve zones afford protection that allows reef ecosystems to recover from consumptive activities and related debris. Heightened protection could provide and sustain the type of visitor experience for which the park was established. With proper protection, Biscayne's signature feature, its coral reef, could become one of South Florida's premier tourist destinations for divers, snorkelers and marine enthusiasts.

In this alternative, the marine reserve zone would include a large section of the seagrass and reef area from Elliott Key east to the park boundary, including Long Reef, Ajax Reef, and Hawk Channel (about 21,884 acres or 14.4% of park waters). Visitors to this zone would be able to engage in most of their current activities in this zone. However, visitors would not be able to engage in recreational and commercial fishing. For these visitors, this restriction would have a minor to moderate adverse impact on their visitor experience. However, because marine reserves worldwide have documented spillover effects where more fish and bigger fish leave the reserve and become available to visitors fishing outside the reserve, a beneficial impact would be expected for visitors fishing immediately outside the marine reserve zone.

Visitors who snorkel and dive in the marine reserve zone would be able to experience a healthier, more natural coral reef than what is currently present, with larger and more numerous tropical reef fish and an ecologically intact reef system. The increased number of mooring buoys would make the snorkeling and scuba diving experience safer and easier. Therefore, a beneficial impact would be expected for visitors who snorkel and dive in the marine reserve zone.

Although anchoring would not be allowed in the marine reserve zone, additional mooring buoys would facilitate access to reefs and historic shipwrecks within this zone as planned in the Mooring Buoy and Marker Plan.

Visitor Services and Facilities

Acquisition of the Fowey Rocks Lighthouse would provide an additional opportunity for visitors to learn about the park's maritime history. The visitor services / park administration zone would apply to the existing park developed areas at Convoy Point and portions of Boca Chita Key, Elliott Key, and Adams Key. Visitor services and facilities would generally remain at current levels. There would be no measurable change from current conditions and trends.

Cumulative Impacts. The expanded developed area according to city and county plans with its associated population increase that is expected to continue are being recognized by local, regional, state, and federal entities as major concerns affecting the region's environmental, economic, and community values. To this end there are a number of recent and ongoing studies and partnership efforts underway in the Biscayne Bay area to improve and protect water quality and quantity, wetlands, fishery resources, and coastal viewsheds. Projects include the *Fishery Management Plan* for *Biscayne National Park; the South Miami-Dade Watershed Study and Plan*; the *Biscayne Bay Surface Water Improvement and Management Plan*; the *Lower East Coast Regional Water Supply Plan*; the Biscayne Bay Partnership Initiative; the Southeast Florida Coral Reef Initiative; and the *Biscayne Bay Coastal Wetlands Plan*.

The actions of this alternative, especially park zoning that could enhance resource conditions, such as the slow speed, noncombustion engine use, sensitive resource, nature observation, and marine reserve zones, combined with these ongoing regional efforts, would have the potential positive cumulative

impact of improving the quality of visitor activities in the region, especially related to fishing, nature viewing, and other resource-based recreational activities. There would also be improved visitor opportunities to learn from various sources regarding the importance and complexity of restoration efforts in a rapidly growing urban environment.

Adjacent state parks (such as Bill Baggs Cape Florida State Park, Key Largo Hammock Botanical State Park, and John Pennekamp Coral Reef State Park) and the Florida Keys National Marine Sanctuary offer services, facilities, and recreational opportunities that enable visitors to experience and learn about the natural and cultural resources of the Biscayne Bay and Florida Keys region. Also, current efforts through the Stiltsville plan and the public access plan for Biscayne Bay provide potential opportunities for enhanced visitor access, education, and recreation related to the Biscayne Bay area.

The actions of this alternative to improve resource conditions and opportunities, especially for dispersed use, nonmotorized boating, and access to solitude, would have the potential beneficial contribution of visitors having a greater range of quality resource-based recreational opportunities available to them in the Biscayne Bay region.

The fishing prohibitions in the marine reserve zone, combined with similar prohibitions and/or restrictions in waters outside of the park boundary, could increase crowding in the few reef patches still open to fishing. This could be a long-term, moderate adverse impact to visitor experience of those fishermen.

The beneficial and adverse contributions of alternative 5, when combined with the beneficial impacts of other actions, would result in beneficial cumulative impacts on visitor experience in the area. Alternative 5's contribution to these cumulative impacts would be small.

Conclusion. Additional slow speed zones, new noncombustion engine use zones, a new access-by-permit zone, and a large marine reserve zone would potentially exclude some visitors or visitor activities from these areas, which would be a long-term, minor to moderate, adverse impact. However, these also would be long-term beneficial impacts on other visitor experiences. This alternative would result in beneficial cumulative impacts on visitor experience in the area. Alternative 5's contribution to these cumulative impacts would be small.

NPS OPERATIONS AND FACILITIES

Actions under alternative 5 would generally have similar impacts on park operations and facilities at Convoy Point and on Boca Chita Keys as those described under alternative 4, including the nine potential visitor contact points outside the park. However, current operations and facilities on Elliott, Adams, and Porgy Keys would continue with no improvements or enhancement. The establishment of an access-by-permit zone, the largest of the proposed marine reserve zones, and the largest of the proposed noncombustion engine use zones will necessitate the installation of numerous markers and navigational aids. The maintenance of these markers represent an increased workload and expense to the park. Thus, actions under this alternative would have long-term, minor, adverse impacts on park facilities due to the additional maintenance requirement.

Actions under alternative 5 would require additional law enforcement and resource management staff and equipment to enforce the park's regulations and protect its resources, although the successful implementation of these special zones would likely result in somewhat fewer groundings and resource damage and consequently less commitment of park staff and budget for legal prosecutions and resource rehabilitation. Nevertheless, these labor-intensive actions would result in short-term, minor to

moderate, adverse impacts on the park budget for equipment acquisition and long-term minor adverse impacts on the park budget for employment of additional personnel and equipment maintenance. Such actions would include the following:

- largest area of protection by slow speed zones, such as the entire west side of Elliott Key of all action alternatives
- largest area of protection by access-by-permit zone in the northwest part of the park of all action alternatives
- largest area of protection by nature observation zone on keys and mainland of all action alternatives
- largest area of protection by noncombustion engine use zones, including West, Middle, and East Featherbed Banks, areas surrounding keys in the south-central area of the park and along the mainland
- largest marine reserve zone of all action alternatives between Elliott Key and the park's eastern boundary
- additional historic structure maintenance for Fowey Rocks Lighthouse

Cumulative Impacts. As discussed under alternative 1, past and ongoing cooperative planning and development projects in the Biscayne Bay region, such as the Biscayne Bay Partnership Initiative, *Miami-Dade County Comprehensive Development Master Plan*, *Biscayne Bay Strategic Access Plan*, and NPS special resource studies (such as those for Miami Circle and Virginia Key Beach Park) have resulted in some long-term beneficial impacts on park operations and facilities. However, these impacts are almost impossible to measure.

This alternative, with its emphasis on natural resource preservation and provision of opportunities for visitors to experience uncrowded park areas as well as establishment of potential visitor contact points outside the park, in combination with the aforementioned beneficial impacts of past and ongoing cooperative planning and development projects in the Biscayne Bay region, would generally result in long-term beneficial cumulative impacts. This alternative's contribution to these impacts would be modest and adverse.

These actions and additional maintenance needs for Fowey Rocks Lighthouse would result in short-term, minor to moderate, adverse impacts on the park's budget resulting from equipment acquisition, and long-term, minor, adverse impacts on the park budget resulting from employment of additional personnel and additional equipment maintenance.

Conclusion. Overall, actions under alternative 5 would generally have long-term, minor to moderate, adverse impacts on park operations and facilities. The overall cumulative impacts would be long term and beneficial; this alternative's contribution to these impacts would be modest and adverse.

SOCIOECONOMIC ENVIRONMENT

Full implementation of this alternative would require 19 additional full-time equivalent positions to handle the increased workload for interpretation, cultural resource management, natural resource management, law enforcement, administrative support, and maintenance. Actual staffing levels would reflect the availability of adequate budgets. Any additional employment along with federal dollars that would be required to implement this alternative is expected to have a long-term beneficial impact on the regional economy.

Under this alterative, visitor access and activities would be highly managed to ensure a high level of natural resource protection and enhancement in the national park, while still enabling visitors to participate in a wide-ranging variety of recreational activities. Visitors would continue to have unrestricted access (multiuse zone) to approximately 71%

of park waters and would be able to engage in a wide range of recreational activities. Adverse impacts now occurring on fishery resources and habitat in the park would be reduced under this alternative due to the additions of slow speed, noncombustion engine use, sensitive resource, access-by-permit, and nature observation zones. It has been estimated that Biscayne Bay-related recreational activities created $3.8 billion in economic output, $2.1 billion in incomes, and 57,000 jobs (Hazen and Sawyer 2005). However, there are indications that Biscayne Bay is showing a decreased capacity, or resilience, to withstand external pressures that may affect the bay's long-term health, and its environmental and economic sustainability (Adams and Blair 2014). These zones would help over time to separate conflicting visitor uses, increase boating safety, and increase nonmotorized recreational opportunities. Economic studies, beginning with Fisher and Krutilla (1972); Cichetti and Smith (1973, 1976); Prince and Ahmed (1988) have shown that congestion will cause recreationists to adjust their length of visit and satisfaction with their recreation experiences. The expected long-term beneficial impacts on park fishery resources and habitat as well as on some visitor experiences associated with the implementation of these zones would result in a long-term beneficial impact on the sustainability of local tourism and resource-based economic activities. Visitor services and facilities improvements would be limited to those deemed essential for basic information and public safety and would be geographically concentrated in the park or located outside park boundaries. This limited development would generally provide an enhanced range of marine-related recreational opportunities in which visitors could enjoy solitude and natural sounds within the park's scenic ambience. It is expected that visitation to the park under this alternative would remain at or near current levels, and that the contribution of park-related visitor expenditures to the regional economy would generally remain unaffected.

Similar to the no-action alternative, the continued presence of Biscayne National Park positively contributes to the value of surrounding private land.

Economic Effects of Marine Reserve Zones

Implementing alternative 5 would result in the creation of a marine reserve zone, which is a no-fishing area. The marine reserve zone in this alternative would comprise about 13% of park waters.

There are many marine protected areas around the world, with varying levels of protection for marine habitats and different restrictions on fishing and recreation. Some areas limit fishing entirely (termed "no-take" areas or marine reserves) while allowing recreational use such as boating and scuba diving. Other areas have limitations on fishing by factors such as species, type of gear used, season, or location. Few comprehensive studies have followed the economic effects of marine protected areas because of the associated complex socioeconomic conditions. This, and the variety of protected area designations, makes comparison of economic effects difficult, but some generalizations can be drawn from some of the larger studies that have been carried out.

In the Philippines, a portion of the Sumilon Island, Cebu, was closed to all fishing for 10 years, while swimming and scuba diving were allowed. After that period, fish abundance had increased three-fold, with the most significant increases among the most highly targeted species (White et al. 2002). Additionally, the yearly fish catch to fishers on the same reef but outside the sanctuary more than doubled, from 14 tons per square kilometer to 36 tons per square kilometer (Russ and Alcala 1996, cited in White et al. 2002). Food security, increased income from tourism, and pride in their protection role were also cited as major benefits of this sanctuary (White et al. 2002). The success of the Sumilon Island sanctuary spurred the creation of numerous other

marine protected areas in the Philippines, with similar outcomes. One of the most important results of the Philippines marine protected area program is the leadership by local communities, who are benefiting most from the protected areas. National oversight provides some general consistency among marine protected areas, but local governments and citizens' groups are leading the procedural and creative development of these areas. Benefits include strong increases in citizens' satisfaction with the fishery management, household income, knowledge of fishery resources, allocation of access rights, and overall participation and influence in community affairs (Katon et al. 1999, cited in White et al. 2002).

Leeworthy and Wiley (2003) investigated both qualitative and quantitative effects of the six "no-take" alternatives that were developed for the Channel Islands National Marine Sanctuary. In the context of the entire diverse economy of the study area, which included San Diego, Los Angeles, and Orange Counties, the authors concluded there would be no significant macroeconomic or fiscal effects from the marine reserves. However, they noted that local economies may be impacted, and that there may be significant effects on certain individuals or groups. In the short term, negative effects or costs may impact the commercial fishing industry and the recreational fishing community because of displacement and loss of income, including secondary losses to associated industries. In the long term, however, these groups may realize benefits because the improved health of fishery resources in the marine reserve would lead to improved fish stocks outside the reserve. The authors found that recreational users who engage in scuba diving, sailing, sightseeing, and wildlife viewing would realize benefits from marine reserves, as would the service providers supporting these activities. The authors note that human response—both from the commercial and recreational fishing sectors and by recreational and passive users—is highly adaptive, and that financial losses are not always realized if these groups adapt quickly to the reserve zones (Leeworthy and Wiley 2003).

Although the establishment of a marine reserve zone could result in some short-term, negligible and adverse impacts on local businesses that formerly took visitors out to fish in the marine reserve zone, the expected spillover effect, where targeted fish species could grow larger and therefore increase in reproductive output, would generally contribute to long-term, beneficial impacts on recreational fishing and associated service-related sectors.

Limited commercial fishing currently takes place in the proposed marine reserve zone. Parkwide phase-out of commercial fishing is addressed in the separate and previously described *Fishery Management Plan*. However, the establishment of a marine reserve zone would terminate commercial fishing in this area of the park immediately, after passage of a park special regulation. This would have a localized, negligible adverse impact on commercial fishing as this activity would have to occur elsewhere in or out of the park.

Nonconsumptive recreation benefits currently taking place in the area, such as snorkeling and scuba diving, would continue in the proposed marine reserve zone. Economic studies have shown that snorkelers and scuba divers would increase trips with improvements in fish abundance, water visibility, and coral quality (Bhat 2003), all of which are expected to occur under this alternative. An increase in recreational scuba diving may increase coral reef damage due to a higher frequency of diver-coral contacts (Chadwick-Furman 1997; Krieger and Chadwick 2012). This would be mitigated through an increased ecotourism management strategy to specifically educate divers about the extra care needed when recreating around coral reefs. Therefore, a long-term beneficial impact would be expected for snorkeling- and scuba diving-related businesses.

Actions under this alternative are anticipated to provide park coral reefs the greatest opportunity for reef ecosystem recovery and increased reef resiliency. Johns et al (2003) report that reef-related expenditures in Miami-Dade County generate $614 million in income and sustain 19,000 jobs in Miami-Dade County and generate nearly $4 billion dollars in sales in the southeast Florida region annually. The establishment of a marine reserve zone has the potential to help sustain the current contributions southeast Florida coral reefs provide to the regional socioeconomic environment.

Cumulative Impacts. Impacts associated with past and ongoing partnership and planning efforts, presence of nearby recreational opportunities and expanded developed area according to city and county plan with its associated population and park visitation increase would be similar to those described under alternative 1.

The actions of this alternative, especially a marine reserve zone and park zoning that could enhance resource conditions, improve access and recreational opportunities and facilities, combined with the ongoing regional efforts, would have the potential to safeguard and improve the sustainability of the local and regional recreational and service-related sectors by ensuring a quality visitor experience and satisfaction, especially related to fishing, nature viewing, and other resource-based recreational activities resulting in a long-term beneficial impact to the regional socioeconomic environment.

The long-term socioeconomic impacts of phasing out commercial fishing in the park are expected to be realized with implementation of the *Fishery Management Plan* and are assessed in that plan. For more information on the *Fishery Management Plan*, please visit http://www.nps.gov/bisc /parkmgmt/fishery-management-plan.htm.

Alternative 5 would contribute a small increment to the above impacts of other past, present, and future actions on socioeconomic conditions and, when considered in combination with other actions, would result in a beneficial cumulative impact.

Conclusion. The strong protection of natural and cultural resources that is expected to enhance resource conditions would have a long-term beneficial impact to the regional socioeconomic environment.

There would be long-term, localized, negligible, adverse impacts to commercial fishing due to the establishment of a marine reserve zone. There would be long-term beneficial impacts would occur to for snorkeling- and scuba diving-related businesses from the continuation of nonconsumptive recreation uses in the marine reserve zone. The expected spillover effect, where targeted fish species could grow larger and therefore increase in reproductive output, would generally contribute to long-term, beneficial impacts on recreational fishing and associated service-related sectors.

The overall cumulative effects would be beneficial. Alternative 5 would contribute a modest increment to these impacts.

UNAVOIDABLE MODERATE OR MAJOR ADVERSE IMPACTS

Unavoidable adverse impacts are defined here as impacts that cannot be fully mitigated or avoided. There would be no unavoidable moderate or major adverse impacts expected as a result of implementing alternative 5.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Alternative 5 would have the smallest potential for some commitments of resources because it would involve the least new development. It is not likely to result in any irreversible or irretrievable commitments of resources. Cultural resources would continue

to be protected through active preservation maintenance.

NATURAL OR DEPLETABLE RESOURCES AND ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

Whenever feasible, the National Park Service strives to maximize the use of renewable resources and energy and therefore minimize the use of depletable resources. However, it is not possible with today's technologies to cost-effectively avoid all use of depletable resources in building and operating facilities.

Implementing alternative 5 would involve no increase in energy requirements.

IMPACTS OF IMPLEMENTING ALTERNATIVE 6

NATURAL RESOURCES

Fishery Resources

In the waters of the multiuse zone (water) impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include impacts on fishery resources and fish habitat caused by boating and fishing in the park. These impacts would continue to be long term, minor to moderate, and adverse.

Proposed management actions under alternative 6 include designating the West, Middle, and East Featherbed Banks as noncombustion engine use zones and expanding this zone in the Jones Lagoon area. This zone would limit the speed and type of boats entering these waters, thus reducing boat traffic overall as well as reducing the impacts associated with boat traffic such as scarring of seagrass beds and localized turbidity. This would be a long-term beneficial impact.

The west coast of Elliott Key from the southwest tip of Sands Key south to Elliott Key Harbor would be designated a slow speed zone. The number of boats entering this area would be reduced because not all boats would be able to travel at slower speeds in the shallow water. The slow speed zone would reduce the potential for scarring in the seagrass beds in this area as well as reduce the potential for turbidity in the water column, thus minimizing adverse impacts on the productivity of this habitat and water quality in the area. The slow speed zone would have a beneficial impact on the quality of fish habitat in this area.

A special recreation zone where spearfishing and commercial fishing (with the exception of the ballyhoo lampara net fishery) are prohibited, recreational fishing would be limited by the number of special fishing permits issued, and additional limitations would be in effect to preserve natural resources and reduce human-caused intrusions. The special recreation zone would include 14,585 acres, which is substantially larger than the marine reserve zone proposed in alternative 4, but less prohibitive to anglers by still allowing recreational fishing under a special license. About 36% of the park's hardbottom habitat would be within this zone, and 64% would be available for fishing outside of special recreation zone. The anticipated reduction in fishing pressure in this zone, where targeted fish species could grow larger and therefore increase in reproductive output, is expected to result in a long-term, beneficial impact on park fishery resources.

The special recreation zone would be implemented using an adaptive management strategy whereby resource conditions and fishing activities are monitored and management actions are reconsidered and adjusted on pre-defined intervals. These evaluation intervals at years 3, 5, and 8 would consider the need to potentially reduce the number of fishing permits to be issued for following years and the need to refine monitoring protocols to improve data quality for future evaluations. Also, the evaluation would consider adjustments to other management actions such as the location and number of mooring buoys and zone boundary markers, marine debris removal, public outreach efforts, and law enforcement efforts. Implementing these adaptive management actions, particularly a reduction in fishing permits issued and removal of marine debris, would be expected to improve fishery resources and fish habitat in general. However, the addition of or relocation of mooring buoys and boundary markers would result in short-term, minor adverse impacts in specific areas associated with underwater installation and associated impacts to

submerged substrates, although every effort would be installed in locations away from corals, seagrass beds, and submerged cultural resources. Increased public outreach and/or law enforcement efforts would probably reduce the potential for illegal harvest of fish and could potentially improve data accuracy and collection through greater oversight. Also, any changes in the monitoring protocol that increases the number or frequency of extractive samples for destructive analysis could have short-term, minor adverse impacts on fish in general or fish habitat. Likewise, monitoring protocols that require installed markers or in situ equipment could have short-term localized, minor adverse impacts to the area around those sites. Additional analysis and agency consultation, as appropriate, would be conducted when site-specific location information has been adequately identified.

Following the 10-year adaptive management period for the special recreation zone, the National Park Service would consider monitoring data and consult with the FWC, NOAA Fisheries, and an expert panel. At that point, the National Park Service would decide whether to continue adaptive management strategies for a special recreation zone or implement a marine reserve zone. The continuation of the special recreation zone would be predicated on the monitoring data demonstrating a sufficiently improved resource condition and the expectation that the trend would continue. Where the decision is made to continue adaptive management and implementation of the special recreation zone, the impacts described above would be expected to continue. Where monitoring trends and indicator data show that management objectives are not being met, the marine reserve zone would be established to eliminate all fishing (except for the removal of exotic invasive species). If the decision is made to convert to a marine reserve zone where fishing is not allowed, it would eliminate commercial and recreational fishing from its area of coral reef habitat. It is anticipated that commercial fishing would be phased out eventually in this area as provided for in the fishery management plan, but implementation of a marine reserve zone would prohibit all commercial fishing in this zone, including the ballyhoo lampara net fishery, after passage of a park special regulation. This locally reduced fishing pressure, where targeted fish species could grow larger and therefore increase in reproductive output, would result in a long-term beneficial impact on park fishery resources. Even though fishing pressure may increase outside this zone, the expected increase in size and abundance of fish within the marine reserve zone is expected to have a spillover effect outside the zone, as documented in other marine reserve zones worldwide.

All the commercial fishing activities that currently occur in the special recreation zone are part of the activities analyzed in the fishery management plan, including a phase-out of all commercial fishing overtime.

Within the special recreation zone, almost all commercial fishing would be prohibited immediately by special regulation with the exception of the ballyhoo lampara net fishery. That one fishery would continue during the adaptive management period but may still be prohibited after 10 years if the decision is made to convert to a marine reserve zone. Prohibition of commercial fishing, whether immediately, at 10 years, or over time, would be a beneficial impact to park fishery resources and fish habitat and the benefit would be greater the sooner the prohibition occurs.

There would be an increase in the number of people fishing from the shoreline if a new boardwalk was built facing the bay waters. This would be expected to have a long-term, negligible, adverse impact on park fishery resources.

This alternative would provide a greater benefit to park fishery resource habitat in the seagrass than alternative 1 because a larger area of seagrass beds in the park would be included in protective zoning designation.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be the similar to alternative 1. The reduction of adverse impacts from human activities on coral reefs and associated ecosystems, combined with efforts from the United States Coral Reef Task Force, would generally result in beneficial impacts. However, the intensity and duration of the cumulative impact of the above planning efforts would depend on the actual number and type of actions taken to implement the identified fundamental themes.

The fishing restrictions in the special recreation zone, combined with similar prohibitions and/or restrictions in waters outside of the park boundary, could increase fishing pressure and related impacts of overfishing and marine debris in the few reef patches still open to fishing. This could be a long-term, moderate adverse impact to those overfished reefs, but the overall impact to fish populations and fish habitat would be mitigated by the protection of prime reefs which serve as nursery grounds to maintain populations of fish species.

This alternative would contribute a beneficial impact to the beneficial impacts of other past, present, and future actions resulting in beneficial cumulative impacts.

Conclusion. Adverse impacts now occurring to fishery resources and fish habitat in the park would persist in most of the park. These impacts will be reduced in the special recreation zone resulting in a long-term beneficial impact to fish and fish habitat in some locations. Cumulative impacts would be beneficial. This alternative's contribution to these impacts would be minor. This alternative would have no new adverse impacts from proposed management actions.

Threatened and Endangered Species

Manatee. Manatees are more likely to be found in the warm waters nearest the shore, so the 1,000-foot-wide slow speed zone adjacent to the entire length of the mainland shoreline would provide protection for manatees in this area. The slow speed zone would provide boat operators a greater opportunity to avoid collisions with manatees by increasing their response time. The expanded slow speed zone under this alternative would also result in fewer boat groundings in seagrass beds, an important habitat/food source for manatees.

The modifications to the manatee protection area and zoning would have a long-term beneficial impact on manatees and manatee habitat in the park.

Section 7 Determination of Effect— Measurable beneficial outcomes on individual manatees and the manatee population because of the protective zones are likely. The determination of effect is "may affect, not likely to adversely affect" for manatee under alternative 6.

Sea Turtles. In the waters of the multiuse zone (water), impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include potential for collisions with boats, strangulation and entanglement with marine debris (including lobster and crab traps), hook-and-line fishing, and vessel groundings on sea turtle foraging habitat (coral and seagrass), which may adversely affect sea turtles, particularly loggerhead, hawksbill, and green species. Leatherback and Kemp's Ridley would be less likely to be affected because they are rarely in the park. These impacts would continue to be long term, minor to moderate, and adverse.

Collisions between boats and sea turtles would be expected to be minimized in the slow speed and the noncombustion engine use zones.

The implementation of a special recreation zone would result in less impact from fishing activities and from derelict fishing gear (monofilament, traps) in this area. This would result in the reduction of threat of entanglement for sea turtles within this zone.

This would be a beneficial, long-term impact on sea turtles in and near that zone.

Studies in Florida and other areas in the world have shown that artificial light adversely impacts sea turtle nesting. Light on Elliott Key is primarily generated from park service facilities, campground, and visitor harbor, all on the bay side of the island. This light does not reach the nesting beaches that are on the ocean side of the island. Any light generated by campers in the group campsite, located on the ocean side of Elliott Key, would be minimal and unlikely to reach sea turtle nesting beaches. Development on Elliott Key would be minimal because only the Breezeway Loop Trail would be improved. There would not be a substantial amount of light from the campsites. Mitigation measures such as education efforts regarding the importance of reducing artificial light, additional monitoring and patrols as visitation increases, and possibly limitations on the number of visitors would reduce the level of adverse impacts. The improvement of the existing trail on Elliott Key could increase the number of visitors that venture to the beaches where the turtles tend to nest. This could require that the park change the management of this area to minimize disturbance to the turtles. Additional mitigation measures could also include increased visitor education and increased monitoring throughout the park and particularly in areas near turtle nesting areas. With mitigation, the impacts would be long term and adverse but negligible.

Section 7 Determination of Effect— Impacts to sea turtles from fishing and boating would persist in most of the park, resulting in a determination of "may affect, likely to adversely affect" for loggerhead, hawksbill, and green species that frequent the park waters.

American Crocodile. Most visitor services and infrastructure in habitat suitable for crocodiles would remain near current levels with the designated paths, with the exception of a possible viewing platform and boardwalk in the vicinity of Convoy Point. This area is north of the designated critical habitat area for the crocodiles and so would not be expected to impact their activities in the park. The mangrove south of the visitor center would continue to be managed primarily to protect the natural habitat characteristics of the area. No additional development within the designated critical habitat would be proposed under this alternative. The impacts of activities on crocodile habitat and activities along the mainland shore would be long term, negligible and adverse.

Under this alternative, a canoe and kayak dock would be built on Porgy Key, but this would only slightly increase the development footprint on this island. The noncombustion engine use zone would include the eastern shoreline of Old Rhodes Key and the waters around Totten Key so relatively few visitors would be expected in this area because of the boating limitations. Although in designated critical habitat, there are relatively few crocodiles in this area of the park.

If the population of crocodiles were to increase within the park, there could be increased interaction between visitors and crocodiles. The developed area at Adams Key provides an excellent opportunity to orient visitors to designated critical habitat for crocodiles, including appropriate actions when traveling in crocodile habitat. With mitigation, the long-term adverse impact of this alternative on the crocodile population in this area of the park would be negligible.

As a whole, the park protects habitat for the crocodile and serves to further its conservation through education and law enforcement, resulting in long-term beneficial impacts to this species.

Section 7 Determination of Effect— The long-term impacts on the American crocodile under alternative 6 would be both beneficial due to habitat protection and education as well as negligible and adverse in localized areas. Mitigation measures would be put in place in the event of more human-crocodile interactions. Overall, this would equate to a

"may affect, not likely to adversely affect" determination for the American crocodile.

Smalltooth Sawfish. In the waters of the multiuse zone (water), impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include potential for bycatch, which could occur with any continuation of hook-and-line fishing efforts as well as potential for entanglement in marine debris such as fishing line and nets. These impacts would continue to be adverse, minor to moderate, and long term, although realizing such effects is unlikely given the rarity of smalltooth sawfish in the park.

While the establishment of the special recreation zone in deeper reef habitat is not likely to have a substantial effect on this species that tends to prefer shallow water, it is possible that implementation of the fishing restrictions and limits on number of fishing licenses issued could have a beneficial impact on smalltooth sawfish by reducing bycatch since reports of this species in reef and deeper water habitats, although uncommon, do exist. No other actions that would occur under this alternative would be expected to affect sawfish in the park.

The special recreation zone would be implemented using an adaptive management strategy whereby resource conditions and fishing activities are monitored and management actions are reconsidered and adjusted on predefined intervals. These evaluation intervals at years 3, 5, and 8 would consider the need to potentially reduce the number of fishing permits to be issued for following years and the need to refine monitoring protocols to improve data quality for future evaluations. Also, the evaluation would consider adjustments to other management actions such as the location and number of mooring buoys and zone boundary markers, marine debris removal, public outreach efforts, and law enforcement efforts. Implementing these adaptive management actions, particularly a reduction in fishing permits issued and removal of marine debris, would be expected to benefit smalltooth sawfish by further reducing the potential for bycatch and entanglement, respectively. Increased public outreach and/or law enforcement efforts would probably reduce the potential for illegal harvest of fish, including smalltooth sawfish, and could potentially improve data accuracy and collection through greater oversight. Also, any changes in the monitoring protocol that increases the number or frequency of extractive samples for destructive analysis could have short-term, minor adverse impacts on fish in general or fish habitat although smalltooth sawfish would not be targeted for such sampling. Additional analysis and agency consultation, as appropriate, would be conducted when site-specific location information has been adequately identified.

Following the 10-year adaptive management period for the special recreation zone, the National Park Service would consider monitoring data and consult with the FWC, NOAA Fisheries, and an expert panel. At that point, the National Park Service would decide whether to continue adaptive management strategies for a special recreation zone or implement a marine reserve zone. The continuation of the special recreation zone would be predicated on the monitoring data demonstrating a sufficiently improved resource condition and the expectation that the trend would continue. Where the decision is made to continue adaptive management and implementation of the special recreation zone, the impacts described above would be expected to continue. Where monitoring trends and indicator data show that management objectives are not being met, the marine reserve zone would be established to eliminate all fishing (except for the removal of exotic invasive species. If the decision is made to convert to a marine reserve zone where fishing is not allowed, it would eliminate commercial and recreational fishing from its area of coral reef habitat. It is anticipated that commercial fishing would be phased out eventually in this area as provided for in the fishery management plan, but implementation of a marine reserve zone would prohibit all commercial fishing in this zone, including the

ballyhoo lampara net fishery, after passage of a park special regulation. This locally reduced fishing pressure, where targeted fish species could grow larger and therefore increase in reproductive output, would result in a long-term very beneficial impact on park fishery resources and effectively eliminate impacts to smalltooth sawfish from bycatch or entanglement in marine debris.

Section 7 Determination of Effect— Existing impacts from fishing would persist in much of the park and may be locally reduced by implementation of the special recreation zone. The section 7 effect determination would be "may affect, likely to adversely affect" for smalltooth sawfish under alternative 6.

Schaus Swallowtail Butterfly and Miami Blue Butterfly. New development on Adams Key where butterfly habitat exists would be limited in scale to include only the staging area for paddlecraft and possibly minimal facilities for the environmental education center. The level of development on the island would occur near the shore where the habitat is less suitable for butterflies and would be unlikely to impact the butterfly population or habitat on the island. The impacts would be long term, negligible, and adverse.

On Elliott Key, the existing Breezeway Loop Trail and boardwalk would be made universally accessible, but this change would probably not alter its footprint or measurably increase visitor use. During improvement activities, the area would be checked by a qualified biologist to ensure that no individuals or preferred nectar or host plants would be disturbed. As a result, the potential disturbance of the butterfly population or habitat would be slight. The impacts would be long term, negligible, and adverse.

Old Rhodes and the other southern keys would be zoned for nature observation, and Swan Key and Soldier Key would be zoned as a sensitive resource area. Impacts on the hardwood hammocks on these keys would not change under this alternative. There would be no impacts on butterfly populations and habitat caused by this alternative.

Continued protection of butterfly habitat on these keys would generally be a beneficial impact to these butterfly species.

Section 7 Determination of Effect— The impacts on the Schaus swallowtail butterfly and the Miami blue butterfly would be both beneficial and long term, negligible and adverse in some locations, but mitigation measures to protect the species' habitat and breeding season are likely to be successful. Overall, the determination of effect for alternative 6 is "may affect, not likely to adversely affect" the Schaus swallowtail butterfly and the Miami blue butterfly.

Stony Corals. In the waters of the multiuse zone (water) impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include the potential for ecological and physical stress to corals from overfishing, fishing debris, anchoring, and/or vessel groundings associated with existing boating and fishing activities. Such impacts are long-term, moderate, adverse impacts to stony corals and their habitat.

The Legare Anchorage would be reduced in size, and in-water activities would continue to be restricted for in-water activities that would provide protection to corals in this area.

The creation of a 14,585-acre special recreation zone would limit fishing and prohibit anchoring on many of the southern reefs in the park, which include areas known to have stony coral populations. Both of these actions are expected to benefit coral populations. Because visitors who would otherwise use the area in the special recreation zone to fish may choose to fish elsewhere with fewer limitations—boat traffic could be expected to decrease. Although unlikely, these decreases could be offset if people use the special recreation zone for nonextractive activities such as snorkeling and scuba diving. Because the special recreation

zone is expected to limit fishing through regulations and improve ecological balance, reduce fishing debris, reduce vessel groundings, and eliminate damage from anchoring in coral habitat, actions under alternative 6 are expected to have a beneficial effect.

The special recreation zone would be implemented using an adaptive management strategy whereby resource conditions and fishing activities are monitored and management actions are reconsidered and adjusted on pre-defined intervals. These evaluation intervals at years 3, 5, and 8 would consider the need to potentially reduce the number of fishing permits to be issued for following years and the need to refine monitoring protocols to improve data quality for future evaluations. Also, the evaluation would consider adjustments to other management actions such as the location and number of mooring buoys and zone boundary markers, marine debris removal, public outreach efforts, and law enforcement efforts. Implementing these adaptive management actions, particularly a reduction in fishing permits issued and removal of marine debris, would be expected to have beneficial impacts on submerged aquatic communities including stony coral habitat. The addition of or relocation of mooring buoys and boundary markers would result in short-term, negligible to minor adverse impacts in specific areas associated with underwater installation and associated impacts to submerged substrates, although every effort would be made to install them in locations away from corals, seagrass beds, and submerged cultural resources. Increased public outreach and/or law enforcement efforts would probably reduce the potential for illegal anchoring that could impact stony corals. Also, any changes in the monitoring protocol that increases the number or frequency of extractive samples for destructive analysis could have short-term, minor adverse impacts on submerged habitats in general although endangered corals would not be targeted for such sampling. Likewise, monitoring protocols that require installed markers or in situ equipment could have localized adverse impacts to the area around those sites and in considering placement of such markers and equipment every effort would be made to avoid impacts to endangered corals and thus the impact would be negligible or nonexistent. Additional analysis and agency consultation, as appropriate, would be conducted when site-specific location information has been adequately identified.

Following the 10-year adaptive management period for the special recreation zone, the National Park Service would consider monitoring data and consult with the FWC, NOAA Fisheries, and an expert panel. At that point, the National Park Service would decide whether to continue adaptive management strategies for a special recreation zone or implement a marine reserve zone. The continuation of the special recreation zone would be predicated on the monitoring data demonstrating a sufficiently improved resource condition and the expectation that the trend would continue. Where the decision is made to continue adaptive management and implementation of the special recreation zone, the impacts described above would be expected to continue. Where monitoring trends and indicator data show that management objectives are not being met, the marine reserve zone would be established to eliminate all fishing (except for the removal of exotic invasive species). If the decision is made to convert to a marine reserve zone where fishing is not allowed, it would eliminate commercial and recreational fishing from its area of coral reef habitat. It is anticipated that commercial fishing would be phased out eventually in this area as provided for in the *Fishery Management Plan*, but implementation of a marine reserve zone would prohibit all commercial fishing in this zone, including the ballyhoo lampara net fishery, after passage of a park special regulation. This locally reduced fishing pressure, where targeted fish species could grow larger and therefore increase in reproductive output, would result in a long-term beneficial impact on the stony coral habitat.

Section 7 Determination of Effect— The special recreation zone in alternative 6 is expected to have a localized long-term, beneficial effect on corals by protecting them from activities that could lead to physical and ecological damage, but existing boating, fishing, and marine debris impacts in most of the park would persist. Thus, this alternative would result in a determination of "may affect, likely to adversely affect" on stony corals.

Cumulative Impacts. Habitat disturbance or loss is the most common reason for a species to be listed. The establishment of Biscayne National Park has provided a protective refuge for listed species resulting in long-term beneficial impacts.

The *Florida Manatee Recovery Plan* and the site-specific county plans are designed in part to reduce boat-related manatee injury and mortality as well as protect habitat areas. These measures are consistent with protection measures incorporated into the proposed actions in this *Final General Management Plan / Environmental Impact Statement*. Implementation of this recovery plan would continue to have a beneficial impact on manatee protection efforts in the park. The efforts to protect the manatee would be strengthened under this alternative with the establishment of a slow speed zone for 1,000 feet of the mainland shoreline. The impacts of this action would continue to have a beneficial impact on manatee protection efforts.

Reintroduction efforts of Miami blue butterflies have occurred on Elliott Key in an attempt to restore this species. If successful, this would be a long-term beneficial impact. The monitoring and recovery plan would continue to be implemented.

Alternative 6 would result in negligible adverse and beneficial impacts on federally listed species. When combined with the impacts of other past, present, and future actions the overall cumulative effect would be beneficial. This alternative would contribute a slight amount to the overall cumulative effects.

Conclusion. Existing impacts to listed species and their habitat would persist in much of the park. Some impacts would be reduced through changes in zoning which would be expected to have localized beneficial impacts. Under this alternative, there would be proposed small-scale development (a canoe and kayak dock at Porgy Key and hardening trails at Elliott Key) that could have long-term negligible adverse impacts on habitats used by American crocodiles, sea turtles, and butterflies. The park would continue to coordinate with the U.S. Fish and Wildlife Service and NOAA Fisheries and work to avoid and mitigate any adverse impacts on these species. Thus, the section 7 determination would be that this alternative "may affect, for those for those species. However, existing impacts to sea turtles, smalltooth sawfish, and stony corals would continue to be long term, moderate and adverse and would result in a "may affect, likely to adversely affect" determination although there are no new impacts to these species associated with any proposed actions. Cumulative effects would be negligible to beneficial. This alternative would contribute a small amount to the overall cumulative effects.

This alternative would have a long-term beneficial impact on manatees due to slow speed and noncombustion engine use zones. It would also have long-term, beneficial impacts to sea turtles, smalltooth sawfish, and stony corals in the special recreation zone, but to a lesser extent than in the marine reserve zone in alternatives 3, 4, and 5 due to continued fishing. There would be greater physical protection of stony corals due to exclusion of traps within the special recreation zone.

Special Status Species, Including State Listed Bird Species

Birds that eat small fish near the water's surface would continue to be impacted in the short term by the continuation of the ballyhoo lampara net commercial fishery that would reduce potential food sources for those bird

species. All the commercial fishing activities that would occur now in the special recreation zone are part of the activities analyzed in the *Fishery Management Plan,* including a phase out of all commercial fishing over time. Within the special recreation zone, almost all commercial fishing would be terminated immediately by special regulation with the exception of the ballyhoo lampara net fishery. That one fishery would continue during the adaptive management period but may still be terminated after 10 years if the decision is made to convert to a marine reserve zone. Termination of commercial fishing, whether immediately, at 10 years, or over time would be a beneficial impact to park fishery resources and the bird species that use them for food. The benefit would be greater the sooner the termination occurs.

Arsenicker Key and West Arsenicker Key host wading bird colonies including state listed wading birds and state listed white-crowned pigeons; West Arsenicker also hosts nesting bald eagles. These keys would be zoned sensitive resource zones and would remain closed to visitors. Furthermore, extending the sensitive resource zone 300 feet into the water around West Arsenicker and Arsenicker Keys would further reduce the likelihood of disturbances to bald eagles, white-crowned pigeons or any other state listed wading birds using these islands. There is currently a bald eagle nest on the mainland shoreline south of Black Point. The establishment of a slow speed zone extending 300' off the mainland shoreline into the bay waters is expected to provide a level of protection to this area which already has low visitation.

Under this alternative, the islands surrounding Jones Lagoon would be zoned as nature observation zones. The small islands within Jones Lagoon and a 300-foot buffer around these islands, and Soldier Key would be zoned sensitive resource zones. Most of the waters of Jones Lagoon would be designated a noncombustion engine use zone. Visitation would be allowed within Jones Lagoon and its surrounding islands, so there would be some potential human-caused intrusions to birds nesting, roosting, loafing, and/or foraging there; however, resource protection would be emphasized. Actions under alternative 6 would reduce, although not eliminate, the potential for disturbance to birds using the Jones Lagoon area because there is still the possibility that small vessels (e.g., paddlecraft) and people coming ashore could closely approach the birds. Actions under alternative 6 and 7 would reduce, although not eliminate, the potential for disturbance to birds using Soldier Key and the Jones Lagoon area because there is still the possibility that small vessels (e.g., paddlecraft) in Jones Lagoon and motor vessels by Soldier Key would approach birds due to low NPS presence in these areas.

The establishment of a visitor services zone on Porgy Key could encourage visitation to the Jones Lagoon area, although the difficulty in accessing this area and the specialized equipment and knowledge needed to safely traverse Jones Lagoon would keep the likelihood of this fairly low. Similarly, access to Soldier Key is also challenging given the shallow waters. Given that visitation to Jones Lagoon and Soldier Key would be expected to remain minimal, adverse impacts on the birds and their habitat would be negligible. If visitation increases such that any state listed birds could be disturbed, management actions could include limiting access to areas where birds are known to nest during nesting season and/or establishing set-back distances following recommendations in scientific literature because human disturbance has the potential for nesting birds to inadvertently crush their eggs while fleeing or to temporarily or permanently abandon their nests, thereby exposing the eggs to predators and extreme temperatures. Under this alternative, not all wading bird colonies would have protective zoning to reduce human disturbance, so the long-term adverse impact on the state listed bird populations in the park would be negligible

The proposed slow speed zone on the bay side of Elliott Key would be expected to reduce the likelihood of disruptions to birds using the coastal areas immediately adjacent to this

zone. As a result, beneficial effects on state listed birds in the immediate area would be expected.

Under this alternative, birds using coastal habitats along the park's mainland shoreline would receive protection from potential boat-related disturbances from a slow speed zone covering the area 1,000 feet from the mainland shoreline. By reducing the speed of boats, the waters immediately adjacent to the mainland shoreline and potential boat-related disturbances would be reduced to birds that are roosting, nesting, foraging, and/or loafing along the mainland shoreline Some birds may still experience disturbance from noise associated with motorized watercraft in this zone, even though boats would be operating at slower speeds.

Overall, this alternative, including any necessary mitigation would probably result in long-term, negligible, adverse due to the proposed development in this alternative. There would be beneficial impacts on state listed bird populations and nesting activity in the park due to the establishment of protective zones around the above-mentioned keys.

Cumulative Impacts. Large-scale habitat loss is an ongoing impact throughout the region, which resulted in the classification of many bird species as state listed. The establishment of Biscayne National Park has provided increased habitat protection for bald eagles and other state listed birds in the park—a long-term beneficial impact.

Alternative 6 would result in negligible impacts on listed birds due to increased visitor use and construction of minor visitor facilities. When combined with the impacts of other past, present, and future actions, the overall cumulative effect would be minor and adverse. This alternative would have a small contribution to the overall cumulative effects.

Conclusion. Under this alternative there would be proposed development that could result in long-term, negligible, adverse impacts on state listed species and would not be likely to lead to federal listing. There would be beneficial impacts to state listed birds through protective zoning that would reduce the likelihood of disturbance in important bird habitats caused by visitor activities.

Terrestrial Vegetation

Under this alternative, the impacts on terrestrial vegetation on the keys, particularly the hardwood hammocks, would occur due to localized construction of minor visitor facilities and continued visitor use. Visitation to the keys would still be expected to increase over current levels because visitor services would be concentrated in these areas. The adverse impacts from increased visitation could include trampling and loss of vegetation from social trails. In general, these impacts could be mitigated by visitor education efforts and trail design to keep visitors on the existing trails. With mitigation measures in place, the impacts would be long term, negligible to minor and adverse. Under this alternative, the existing Breezeway Loop Trail and boardwalk would be hardened to make them accessible. With mitigation, the localized impacts on vegetation would be long term, negligible and adverse.

Long-term impacts from the proposed Convoy Point boardwalk would include the removal of mangroves and other wetland plants, trimming mangroves, and would have shading impacts on mangroves and other vegetation. Localized impacts would be long term, minor, and adverse.

Under this alternative, much of the mainland shoreline, Sands Key, and the islands surrounding Jones Lagoon would be zoned as nature observation zones and visitation would be allowed, however protection would be emphasized. This expected to have a long-term beneficial impact on terrestrial vegetation on these islands.

Cumulative Impacts. An exotic plant management plan has been developed for

Biscayne National Park and eight other national parks in the region. Exotic invasive plant species can change the structure and function of native plant communities. These changes can have an adverse impact on habitat for native species that rely on the native plant communities. Vegetation disturbances caused by social trails and trampling of native vegetation encourages growth of invasive species. Removal of nonnative species would provide better conditions to reestablish native vegetation in disturbed areas, which could help mitigate the adverse impacts associated with social trails in the park. Implementation of this plant management plan would have a beneficial impact on terrestrial vegetation in the park and the habitat it provides.

When the negligible to minor adverse impacts of alternative 6 are combined with the beneficial impacts of other past, present, and future actions, the resulting cumulative impacts would continue to be beneficial. This alternative would slightly reduce these beneficial cumulative impacts.

Conclusion. Implementing this alternative would result in long-term, negligible to minor adverse impacts on terrestrial vegetation in localized areas associated with minor construction projects and continued or increasing visitor use. Cumulative impacts would be beneficial. This alternative would slightly reduce these beneficial cumulative impacts. Adverse impacts would be less than alternative 2 due to the smaller footprint of trail improvements on Elliott Key.

Wetlands

Wetlands in the park would continue to serve as an important habitat area for a wide variety of terrestrial and aquatic species. Placement of the nature observation zone and the slow speed zone in the open water along the mainland shoreline along portions of the mainland would give greater protection to mangrove shorelines. This would have long-term, beneficial impacts.

Under this alternative, construction of a boardwalk or viewing platform would be considered to interpret the mangrove forests and the mangrove shoreline north of the visitor center at Convoy Point; also, the visitor center boardwalk and jetty could be upgraded. With these improvements, visitors would have an opportunity to experience the mangroves along the shore north of the visitor center at Convoy Point. Construction of the boardwalk and viewing platform would cause both short-term and long-term adverse impacts on the mangroves along the mainland shoreline of the park. During construction, there would be short-term adverse impacts on water quality from increased turbidity. Increased turbidity in the water column could degrade the habitat for wetland plant species. These localized impacts would be short-term, minor to moderate, and adverse.

Long-term impacts from the proposed boardwalk might include removal of some mangroves and other wetland plants, trimming mangroves, and shading mangroves and other aquatic life. Impacts would be long term, minor, and adverse. These impacts could be mitigated during the design process to ensure that the structures do not substantially shade the mangroves.

No additional access into the mangroves that fringe the keys would be developed under this alternative so there would be no change in the current size, integrity, or continuity of these other wetland areas in the park. Mangroves are extremely difficult to walk through, and while the proposed visitor facility improvements at Porgy, Elliott, and Boca Chita Keys might attract more visitors—this is not likely to affect the wetlands.

Cumulative Impacts. The Biscayne Bay Coastal Wetlands Project of the Comprehensive Everglades Restoration Plan includes pump stations, spreader swales, stormwater treatment areas, flow ways, levees, culverts, and backfilled canals in southeast Miami-Dade County and covers 13,600 acres from the Deering Estate south to the Turkey Point Power Plant. The purpose of this project

is to rehydrate wetlands and reduce point source discharge into Biscayne Bay. The proposed project would replace lost overland flow and partially compensate for the reduction in groundwater seepage by redistribution through a spreader system, with available surface water entering the area from regional canals. The proposed redistribution of freshwater flow across a broad front is expected to restore or enhance freshwater wetlands, tidal wetlands, and nearshore bay habitat.

Sustained lower-than-seawater salinities are required in tidal wetlands and the nearshore bay to provide nursery habitat for fish and shellfish. This project is expected to create conditions that will be conducive to the reestablishment of oysters and other components of the oyster reef community. Diversion of canal discharges into coastal wetlands is expected not only to reestablish productive nursery habitat along the shoreline, but also to reduce the abrupt freshwater discharges that are physiologically stressful to fish and benthic invertebrates in the bay near canal outlets. The impact of these actions once implemented would be beneficial for wetlands inside and outside the park.

The Biscayne Bay Coastal Wetlands Project could improve the overall health of the wetland areas along the mainland shoreline such that the system as a whole is better able to accommodate the stresses associated with the short- and long-term impacts of the development and human use in the area.

This alternative would contribute minor adverse impacts to the beneficial impacts of other present and future actions resulting in a beneficial cumulative impact. This alternative would slightly reduce these beneficial cumulative impacts in localized areas.

Conclusion. Localized impacts associated with construction under this alternative would be short term, minor to moderate adverse. The long-term impacts of the new facilities would be mitigated through design and would be adverse and minor. Cumulative impacts would be beneficial. This alternative would slightly reduce these beneficial cumulative impacts.

Submerged Aquatic Communities

In the waters of the multiuse zone impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include impacts on submerged aquatic communities caused by boating and fishing and associated marine debris. These impacts would continue to be long term, minor to moderate, and adverse.

Under this alternative, there would be greater controls on speed and vessel types in areas where there are submerged aquatic communities, particularly seagrass beds. The West, Middle, and East Featherbed Banks, the waters within Jones Lagoon would be zoned for noncombustion engine use. Boats in this zone would be traveling relatively slowly, and fewer boats would be operating with high-speed propellers so the potential for scarring of the seagrass beds and hardbottom communities would be substantially reduced. Within the noncombustion engine use zone, the potential for turbidity in the water column caused by motorboats would also be reduced. Thus, the health of the seagrass beds would be higher under this alternative—a long-term beneficial impact.

The bay side of Elliott Key from Sands Cut to Elliott Key Harbor and a strip along the mainland shore from 1,000 feet out would be zoned as a slow speed area to protect natural marine resources such as seagrass. Because the boats in these areas would be traveling at a reduced rate of speed, there would be reduced potential for seagrass scarring. Overall, the health of the seagrass beds would be expected to increase under this alternative because of the increased areas zoned for slow speeds and noncombustion engines. The increase in the health of seagrass beds would be a long-term beneficial impact.

Under this alternative, a special recreation zone would be designated from Hawk Channel east to the park boundary from 2 miles south of Pacific Reef to north of Long Reef. The special recreation zone includes limitations that accommodate some recreational fishing while meeting the goal of providing a healthy coral reef ecosystem for a more enjoyable and diverse visitor experience. Fishing activities would be restricted to protect resources in this zone, but some fishing would still occur, which could result in marine debris and conflicts with other users. It would be expected that the adverse impacts on the reef from fishing-related activities would be reduced under this alternative compared to alternative 1, but not eliminated. In particular, the prohibition on anchoring would reduce the potential for scarring, but there could still be ecological adverse impacts from allowing some fishing and other currently existing recreational activities such as scuba diving. There would still be potential impacts to submerged aquatic communities in this zone due to vessel groundings and reef breakage or damage caused by scuba diving activities (Barker and Roberts 2004; Hall 2001; Medio et al. 1997). Implementation of the special recreation zone would generally reduce the impacts of recreational activities in this area of the reef due to exclusion of traps within this zone, resulting in a long-term beneficial impact. Moderate, adverse impacts from fishing and anchoring would continue outside the special recreation zone.

The special recreation zone would be implemented using an adaptive management strategy whereby resource conditions and fishing activities are monitored and management actions are reconsidered and adjusted on pre-defined intervals. These evaluation intervals at years 3, 5, and 8 would consider the need to potentially reduce the number of fishing permits to be issued for following years and the need to refine monitoring protocols to improve data quality for future evaluations. Also, the evaluation would consider adjustments to other management actions such as the location and number of mooring buoys and zone boundary markers, marine debris removal, public outreach efforts, and law enforcement efforts. Implementing these adaptive management actions, particularly a reduction in fishing permits issued and removal of marine debris, would be expected to have beneficial impacts on submerged aquatic communities including corals and seagrass beds. However, the addition of or relocation of mooring buoys and boundary markers would result in short-term, minor adverse impacts in specific areas associated with underwater installation and associated impacts to submerged substrates, although mooring buoys and boundary markers would be placed away from corals, seagrass beds, and submerged cultural resources. Increased public outreach and/or law enforcement efforts would probably reduce the potential for illegal anchoring that could impact submerged aquatic communities and thus is a beneficial impact. Also, any changes in the monitoring protocol that increases the number or frequency of extractive samples for destructive analysis could have short-term, minor adverse impacts on submerged habitats in general although sensitive submerged aquatic communities would not be targeted for such sampling. Likewise, monitoring protocols that require installed markers or in situ equipment could have localized negligible adverse impacts to the area around those sites and in considering placement of such markers and equipment every effort would be made to avoid impacts to corals and seagrass beds and thus the impact would be negligible or nonexistent. Additional analysis and agency consultation, as appropriate, would be conducted when site-specific location information has been adequately identified.

Following the 10-year adaptive management period for the special recreation zone, the National Park Service would consider monitoring data and consult with the FWC, NOAA Fisheries, and an expert panel. At that point, the National Park Service would decide whether to continue adaptive management strategies for a special recreation zone or implement a marine reserve zone. The continuation of the special recreation zone

would be predicated on the monitoring data demonstrating a sufficiently improved resource condition and the expectation that the trend would continue. Where the decision is made to continue adaptive management and implementation of the special recreation zone, the impacts described above would be expected to continue. Where monitoring trends and indicator data show that management objectives are not being met, the marine reserve zone would be established to eliminate all fishing (except for the removal of exotic invasive lionfish). If the decision is made to convert to a marine reserve zone where fishing is not allowed, it would eliminate commercial and recreational fishing from its area of coral reef habitat. It is anticipated that commercial fishing would be phased out eventually in this area as provided for in the fishery management plan, but implementation of a marine reserve zone would prohibit all commercial fishing in this zone, including the ballyhoo lampara net fishery, after passage of a park special regulation. This locally reduced fishing pressure, where targeted fish species could grow larger and therefore increase in reproductive output, would result in a long-term beneficial impact on the submerged aquatic habitats.

Cumulative Impacts. Boat groundings and anchoring have damaged seagrass beds, coral reefs, and hardbottom communities, and degraded habitat for fish, shrimp, crabs, lobsters, and other invertebrates that inhabit these areas.

Coral reefs are complex ecosystems and sensitive to disturbances. Fishing, snorkeling, and scuba diving can also have adverse impacts on coral reef systems. The damage caused by these activities includes scarring from boat propellers and inadvertent placement of anchors, as well as breakage caused by snorkeling and scuba diving. Fishing gear and debris can break, smother, and entangle benthic resources on coral reefs and in seagrass meadows. Fishing also results in removal of predators and the removal of herbivorous fish that keep algae minimized (contributes to reef health). Damage to the coral reefs also adversely impacts other species that rely on the reefs for food and shelter. Damage to the seagrass beds, hardbottom communities, and coral reefs would continue to be a long-term, minor to moderate, and adverse impact.

Alternative 6 would reduce some of the existing impacts associated with recreational and commercial boating and fishing use, which result in long-term beneficial impacts. When combined with the adverse impacts of other past, present, and future actions, the cumulative impacts would be minor to moderate and adverse. The contribution to this alternative would be small.

Conclusion. Impacts associated with boating and fishing would continue to have long-term, minor to moderate, adverse impacts in most of the park. In some areas where protective zoning would be in place around particularly sensitive resources, alternative 6 would result in long-term beneficial impacts on submerged aquatic communities. Cumulative impacts would be minor to moderate and adverse, although the actions proposed in alternative 6 would modestly reduce these adverse cumulative impacts of other past, present, and reasonably foreseeable actions.

Benefits would be less than alternative 3 due to the continued adverse ecological impact from allowing some fishing in the special recreation zone. Physical protection for this resource would be greater due to exclusion of traps within the larger special recreation zone.

Soundscapes

In the waters of the multiuse zone, impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include short-term, minor to moderate adverse impacts caused by boat noise on the water as well as short-term negligible adverse impacts caused by vehicles and routine maintenance equipment on land. In both cases, these noises can transcend the

zone in which they originate and be heard in adjacent zones.

Natural soundscapes predominate in the distant portions of the park, away from popular boating routes. Increases in visitation on weekends and during special events add to the number of boats on the bay at one time. The expanded developed area according to city and county plans with its associated population increase is expected to continue and would be expected to result in increased boating and boat engine noise.

Impacts associated with an increased number of boats in the park would be short term, minor to moderate, and adverse.

Under alternative 6, there would be areas of the bay zoned for slow speed or noncombustion engine use. Because these limitations would reduce the level and duration of noise from boats, there would be long-term, beneficial impacts on soundscapes on portions of the bay and adjacent land.

There would a limited amount of new construction in this alternative occurring mostly in the visitor services and park administration zone. This would result in short-term, localized, adverse impacts that would be negligible to minor in intensity. Use of the new or upgraded facilities would result in a long-term negligible adverse impact to natural soundscapes.

Existing natural soundscapes in the interior of the larger keys would continue to be preserved by protective zoning and relatively low visitor use—a continuing beneficial impact.

Cumulative Impacts. The expanded developed area according to city and county plans with its associated population increase is expected to continue and would be expected to result in increased boating and boat engine noise.
The beneficial and adverse impacts of this alternative, in combination with the adverse impacts of other actions, would result in minor and adverse cumulative impacts on the natural soundscape; however, the contribution of this alternative to these impacts would be a slight reduction of these adverse cumulative impacts.

Conclusion. Implementing alternative 6 would have long-term beneficial impacts on soundscapes due to protective zoning. Short-term negligible to minor, adverse impacts during construction and existing minor to moderate adverse impacts on natural soundscapes would continue as a result of persistent boat-related noise in much of the park. Existing short-term, negligible adverse impacts on natural soundscapes would continue as a result of routine park operations and maintenance activities.

CULTURAL RESOURCES

Archeological Resources (including submerged archeological)

Implementation of this alternative would have similar impacts on archeological resources as those listed in alternative 1. The strong emphasis on cultural resource protection could be expected to have some additional beneficial impacts on archeological resources (including submerged archeological) sites. Actions under this alternative, such as exclusion of visitors from West Arsenicker, Arsenicker, and Swan Keys and prohibition of anchoring and fishing limitations in the special recreation zone would generally contribute to beneficial impacts on potential and known terrestrial and submerged archeological resources. Adverse impacts from fishing gear would remain, and the added protections in alternative 6 would provide far less potential for treasure hunting, looting, amateur collection, and inadvertent visitor impacts.

The special recreation zone would be implemented using an adaptive management strategy whereby resource conditions and fishing activities are monitored and management actions are reconsidered and adjusted on pre-defined intervals. These

evaluation intervals at years 3, 5, and 8 would consider the need to potentially reduce the number of fishing permits to be issued for following years and the need to refine monitoring protocols to improve data quality for future evaluations. Also, the evaluation would consider adjustments to other management actions such as the location and number of mooring buoys and zone boundary markers, marine debris removal, public outreach efforts, and law enforcement efforts. Implementing these adaptive management actions, particularly a reduction in fishing permits issued and the associated reduction in the generation of marine debris as well as the active removal marine debris would be expected to have beneficial impacts on submerged cultural resources. Increased public outreach and/or law enforcement efforts would probably reduce the potential for illegal anchoring that could impact submerged cultural resources.

Following the 10-year adaptive management period for the special recreation zone, the National Park Service would consider monitoring data and consult with the FWC, NOAA Fisheries, and an expert panel. At that point, the National Park Service would decide whether to continue adaptive management strategies for a special recreation zone or implement a marine reserve zone. The continuation of the special recreation zone would be predicated on monitoring data demonstrating a sufficiently improved resource condition and the expectation that the trend would continue. Where the decision is made to continue adaptive management and implementation of the special recreation zone, the impacts described above would be expected to continue. Where monitoring trends and indicator data show that management objectives are not being met, the marine reserve zone would be established to eliminate all fishing (except for the removal of exotic invasive species). If the decision is made to convert to a marine reserve zone where fishing is not allowed, it would eliminate commercial and recreational fishing from its area of coral reef habitat. It is anticipated that commercial fishing would be phased out eventually in this area as provided for in the *Fishery Management Plan*, but implementation of a marine reserve zone would prohibit all commercial fishing in this zone, including the ballyhoo lampara net fishery, after passage of a park special regulation. This prohibition of fishing would virtually eliminate the on-site generation of fishing-related marine debris and its associated impacts on submerged cultural resources, which would be a long-term beneficial impact. The potentially increased scuba diving-related activities associated with a healthy and attractive coral reef system could have negligible to minor adverse impacts on submerged cultural resources due to depreciative visitor behaviors and accidental damage.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. As described above, implementation of alternative 6 would result in negligible to minor adverse impacts and beneficial impacts. The impacts of alternative 6, in combination with negligible to minor adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a negligible to minor adverse cumulative impact. The adverse impacts of alternative 6 would be a small component of the adverse cumulative impact.

Conclusion. Implementation of this alternative would have beneficial impacts on archeological resources because of the potential for reduced anchor damage and decreased visitation pressures on some submerged archeological resources. However, minor adverse impacts from derelict fishing gear would remain. The emphasis on natural resource preservation, as well as protection of significant cultural resources, could be expected to have some additional long-term beneficial impacts on archeological sites. Actions under this alternative would have a cumulative beneficial impact on archeological resources.

Section 106 Summary. The implementation of this alternative could include some minor adverse impacts on archeological resources. If impacts remain minor, there would be no adverse effects under section 106. Any adverse impacts resulting from moderate or major impacts would be mitigated through the use of *The Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation* and a memorandum of agreement with the state historic preservation office and Advisory Council on Historic Preservation to counteract such adverse effects.

Historic Structures and Buildings

Implementation of this alternative would have similar impacts on historic structures and buildings in Boca Chita Key Historic District and at Fowey Rocks Lighthouse as those listed under alternative 1 because the structures and buildings would be rehabilitated, preserved, and adaptively used in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. Some minor elements of historic fabric could be lost as a result of remodeling/rehabilitation efforts, and anticipated increasing visitation levels could result in loss of some historic fabric from inadvertent visitor use or vandalism. As with alternative 1, impacts on historic structures and buildings would be localized, long-term to permanent, generally beneficial, and of negligible to moderate intensity.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar as those described under alternative 1. As described above, implementation of alternative 6 would result in negligible to minor adverse impacts and beneficial impacts. The impacts of alternative 6, in combination with negligible to minor adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long- and short-term beneficial impact. The adverse impacts of alternative 6 would be a small component of the adverse cumulative impact.

Conclusion. Implementation of this alternative would have similar impacts on historic structures and buildings in the Boca Chita Key Historic District as those listed under alternative 1 because they would be rehabilitated, preserved, and interpreted by the National Park Service in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. As with alternative 1, impacts on historic structures and buildings would be localized, long-term to permanent, and generally beneficial. Implementation of this alternative would have a long-term, beneficial impact on the Fowey Rocks Lighthouse because it would be preserved in accordance with the Secretary's Standards.

Actions under this alternative would have similar cumulative impacts on historic structures and buildings in the park as those listed under alternative 1. Implementation of this alternative would have cumulative beneficial impacts.

Section 106 Summary. The implementation of this alternative could include some minor adverse impacts on historic structures and buildings. If impacts remain minor there would be no adverse effects under section 106. Any adverse impacts resulting from moderate or major impacts would be mitigated through the use of *The Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation* and a memorandum of agreement with the state historic preservation office and Advisory Council on Historic Preservation to counteract such adverse effects.

Cultural Landscapes

Implementation of this alternative would have similar impacts on cultural landscapes in the park as those listed under alternative 1 because potential landscapes would continue to be surveyed, inventoried, and evaluated

under NRHP criteria, and the National Park Service would implement resource management policies that preserve the natural resource values and culturally significant character-defining patterns and features of Boca Chita Key as well as other listed, or determined eligible, landscapes in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties With Guidelines for the Treatment of Cultural Landscapes*.

Although this alternative would emphasize strong cultural resource protection, enhancement of recreational opportunities and development of visitor services and facilities on Boca Chita, Elliott, and Porgy Keys could result in some minor impacts on the integrity of the listed and potential cultural landscapes at those visitor destination points. Expansion of recreational opportunities and development of enhanced visitor services throughout much of the park lands and waters could also result in some minor impacts on the integrity of the potential parkwide maritime and cultural landscape, actions under this alternative, such as the creation of the special recreation zone, would generally contribute to beneficial impacts to a potential marine cultural landscape. Restoration activities at the Jones homesite would have localized, long-term beneficial impacts as well.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. As described above, implementation of alternative 6 would result in negligible to minor adverse impacts and beneficial impacts. The impacts of alternative 6, in combination with long-term, minor adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term, minor adverse cumulative impact. The adverse impacts of alternative 6 would be a small component of the adverse cumulative impact.

Conclusion. Implementation of this alternative would have similar beneficial impacts on cultural landscapes as those listed under alternative 1. Although the emphasis is on natural resource preservation, the strong protection provided cultural resources could be expected to have some additional long-term beneficial impacts.

Actions under this alternative would have similar cumulative impacts on cultural landscapes as those listed under alternative 1. This alternative's contribution to these cumulative impacts would be small.

Section 106 Summary. The implementation of this alternative could include some minor adverse impacts on cultural landscapes. If impacts remain minor, there would be no adverse effects under section 106. Any adverse impacts resulting from moderate or major impacts would be mitigated through the use of *The Secretary of the Interior's Standards and Guidelines for Documentation and Treatment of Cultural Landscapes* and a memorandum of agreement with the state historic preservation office and Advisory Council on Historic Preservation to counteract such adverse effects.

VISITOR EXPERIENCE

Diversity of Visitor Activities

Under this alternative, visitors would continue to have unrestricted access (as described in the multiuse zone) to most park waters (approximately 83%) to participate in a wide range of recreational opportunities such as motorboating, sailing, paddling, swimming, scuba diving, snorkeling, fishing, and nature study. About 8% of the park would have some limitations or changes (existing and new) that would potentially enhance, modify, limit, or prohibit visitor access and activities.

This alternative would require visitors to maintain slow speeds near the mainland and Sands Cut. It would also add a slow speed zone to Caesar Creek and the west side of Elliott Key beginning at Sands Key and extending south to Elliott Key Harbor. These

slow speed zones would help visitors focus attention on these relatively shallow, sensitive, and sometimes busy areas of the bay, thus enhancing visitor safety. Slower speeds would help reduce damage to boats in docks and the frequency of boat groundings, which would be an indirect, long-term, beneficial impact on some visitors. For some visitors, this change would be perceived as a minor, adverse impact on their visitor experience while boating in the park. For other visitors these reduced speeds would enhance their sense of safety and opportunities for swimming, wading, and fishing. The total area that would have slow speed limits would be about 2% of park waters.

The noncombustion engine use zone would include two areas that generally are shallow, where caution is needed, and where different visitor experiences are available. The waters around the park's southern keys, including the bay side of Old Rhodes and Totten, and near portions of Rubicon, Reid, Porgy, and Swan Keys. It would also include West, Middle, and East Featherbed Banks. This prohibition of combustion engine use (with some limited exceptions) would potentially have a negative impact on those visitors who are used to accessing these areas of the park with combustion engines. For some visitors, this change would be perceived as a long-term adverse impact on their visitor experience while boating in the park. This zoning would potentially have a beneficial impact on the experience of many visitors who currently use or would like to use these areas of the park to explore the mangroves and more remote key environments in paddlecraft. Prohibiting combustion engines would enhance visitors' abilities to more successfully view wildlife and experience the natural sounds of the bay and mangrove environments as well as increase the likelihood that some visitors would be able to achieve a sense of solitude and tranquility. Also, boaters would have less likelihood of grounding in this zone, and flats anglers would have improved conditions for successful catches. This noncombustion engine use zone would affect less than 1% of park waters.

Under this alternative, Legare Anchorage would be reduced in size relative to current conditions. This would result in visitors having access to an additional 1,258 acres of reef waters for a full range of recreational activities (multiuse zone). The sensitive underwater archeological zone, which would be applied to a smaller area at Legare Anchorage, would allow limited visitor access, which is currently the case. The addition of 1,258 acres to the multiuse zone would provide visitors with enhanced opportunities for access and recreation, which would be a long-term beneficial impact on visitors' abilities to access and recreate in park waters.

The continued closure to visitors of West Arsenicker and Arsenicker Keys would not change. What would change under this alternative is the application of the sensitive resource zone 300 feet out from these keys' shorelines. This would be a modest increase over the current 200-foot closure. Also, Swan Key and Soldier Key would be closed to visitors. This area is currently lightly used because of limited accessibility and those visitors who expect unrestricted access might find this closure to be a long-term, minor, adverse impact on their ability to experience the area.

Northern and southern portions of the mainland, the southern keys, and all of Sands Key would be zoned nature observation. The relative inaccessibility of the mangrove forests and tropical hardwood hammocks naturally limits the range of visitor activities. Most visitors to these areas would probably experience few interactions with others and would have opportunities to explore, observe nature, and find solitude.

An area from Hawk Channel to the eastern park boundary (about 8% of park waters) would be placed in the special recreation zone with recreational fishing by special permit and other limitations on fishing activities. Visitors to this zone would be able to engage in most of their current activities, and the future concessioner would be able to take visitors

here. For anglers, these fishing limitations would result in a moderate adverse impact on their visitor experience. Overall, the reduced fishing pressure in this zone may result in more and bigger fish over time, which would result in a beneficial impact to both anglers and nonanglers.

Visitors who snorkel and scuba dive in the special recreation zone would be able to experience a healthy, more natural coral reef than what is currently present, with larger and more numerous tropical reef fish and an ecologically intact reef system. The increased number of mooring buoys would make the snorkeling and scuba diving experience safer and easier. The prohibition on spearfishing also improves visitor safety. Therefore, a beneficial impact would be expected for visitors who snorkel and scuba dive in the special recreation zone.

Anchoring would not be allowed in the special recreation zone and some visitors may feel this is adverse impact on their visitor experience due to their lack of freedom to choose their stationary location. However, this should not be an adverse impact as additional mooring buoys would be provided to facilitate access to reefs and historic shipwrecks within this zone. The shift from anchoring to use of mooring buoys would improve resource conditions, which would improve visitor experience and create a safer environment for park visitors.

The special recreation zone may also increase visitor confusion due to new permit requirements and other location-specific regulations. This would also increase law enforcement requirements. The requirement to obtain a special fishing permit would provide an opportunity to specifically educate anglers about the new limitations and benefits to park resources. These concerns would result in short-term, minor, adverse impacts to visitors initially after implementation of the new regulations.

The special recreation zone would be implemented using an adaptive management strategy whereby resource conditions and fishing activities are monitored and management actions are reconsidered and adjusted on predefined intervals. These evaluation intervals at years 3, 5, and 8 would consider the need to potentially reduce the number of fishing permits to be issued for following years and the need to refine monitoring protocols to improve data quality for future evaluations. Over time, the size and abundance of fish in the special recreation zone is expected to increase during the adaptive management period and this would have beneficial impacts on the quality of visitor experience afforded to anglers, scuba divers, and snorkelers. Also, the evaluation would consider adjustments to other management actions such as the location and number of mooring buoys and zone boundary markers, marine debris removal, public outreach efforts, and law enforcement efforts. Implementing these adaptive management actions, particularly a reduction in fishing permits issued and removal of marine debris, would be expected to improve visitor experience for divers and snorkelers. However, the addition of or relocation of mooring buoys and boundary markers would result in short-term, minor adverse impacts to visitors if they are unaware of the current location of buoys or find that their favorite mooring location is no longer available. While every effort would be made to communicate changes in a timely manner to the visiting public, inevitably there will be some amount of visitor confusion and frustration during the adaptive management period as adjustments are made and visitor expectations are not realized, thus resulting in a short-term, minor adverse impact. Increased public outreach and/or law enforcement efforts would probably reduce the potential for unlawful and/or negative visitor behaviors and would probably improve visitor safety, thus realizing a beneficial impact.

Following the 10-year adaptive management period for the special recreation zone, the National Park Service would consider monitoring data and consult with the FWC, NOAA Fisheries, and an expert panel. At that

point, the National Park Service would decide whether to continue adaptive management strategies for a special recreation zone or implement a marine reserve zone. The decision to either continue the adaptive management strategies or implement a marine reserve would be predicated on the monitoring data showing a sufficiently improved resource condition and that the park has met its goals for an improved visitor experience in the zone; and the expectation that the trends would continue; otherwise, the marine reserve zone would be implemented to more immediately address the downward trend in resource conditions and/or visitor experience. Where monitoring trends and indicator data show that management objectives are not being met, the marine reserve zone would be established to eliminate all fishing (except for the removal of exotic invasive species). If the decision is made to convert to a marine reserve zone where fishing is not allowed, it would eliminate commercial and recreational fishing from its area of coral reef habitat. It is anticipated that commercial fishing would be phased out eventually in this area as provided for in the park's *Fishery Management Plan*, but implementation of a marine reserve zone would prohibit all commercial fishing in this zone immediately, including the ballyhoo lampara net fishery, after passage of a park special regulation. This locally reduced fishing pressure, where targeted fish species could grow larger and therefore increase in reproductive output, would result in long-term beneficial impacts on the quality of visitor experience afforded to anglers, scuba divers, and snorkelers.

Visitor Services and Facilities

The northern half of Boca Chita Key would be designated as a visitor services / park administration zone. Some of the historic structures could be used for expanded visitor services that might be provided through on-site staff or wayside exhibits. This would be a beneficial impact on enhancing visitors' opportunities to learn about and experience the key.

In the harbor area at Elliott Key, accessibility for visitors would be enhanced through hardening the trail connecting the harbor with the ocean side. This would be a beneficial enhancement of visitor opportunities to better access the ocean side of Elliott Key.

The park would consider using Adams Key as a backup staging area for paddlecraft and might use Adams Key as a staging area for paddlecraft to access Porgy Key during special events or programs.

At Porgy Key, a dock for paddlecraft and interpretation of the old homesite would provide long-term beneficial improvements in visitor opportunities to learn about and experience that key.

Cumulative Impacts. The expanded developed area according to city and county plans with its associated population increase that is expected to continue are being recognized by local, regional, state, and federal entities as major concerns affecting the region's environmental, economic, and community values. To this end, there are a number of recent and ongoing studies and partnership efforts underway in the Biscayne Bay area to improve and protect water quality and quantity, wetlands, fishery resources, and coastal viewsheds. Projects include the *Fishery Management Plan* for Biscayne National Park; the *South Miami-Dade Watershed Study and Plan*; the *Biscayne Bay Surface Water Improvement and Management Plan*; the *Lower East Coast Regional Water Supply Plan*; the Biscayne Bay Partnership Initiative; the Southeast Florida Coral Reef Initiative; and the *Biscayne Bay Coastal Wetlands Plan*.

The actions of this alternative, especially park zoning that could enhance resource conditions such as the slow speed, noncombustion engine use, sensitive resource, and nature observation zones, combined with these ongoing regional efforts, would have the potential to improve the quality of visitor

activities in the region, especially related to fishing, nature viewing, and other resource-based recreational activities. There would also be improved visitor opportunities to learn from various sources regarding the importance and complexity of restoration efforts in a rapidly growing urban environment.

Adjacent state parks (such as Bill Baggs Cape Florida State Park, Key Largo Hammock Botanical State Park, and John Pennekamp Coral Reef State Park) and the Florida Keys National Marine Sanctuary offer services, facilities, and recreational opportunities that enable visitors to experience and learn about the natural and cultural resources of the Biscayne Bay and Florida Keys region. Also, current efforts through the General Management Plan Amendment: Stiltsville Management Plan, and the Biscayne Bay Coastal Wetlands project provide potential opportunities for enhanced visitor access, education, and recreation related to the Biscayne Bay area.

The actions of this alternative to improve access and recreational opportunities and facilities would have the potential positive contribution of more and better public information about and access to the Biscayne Bay area and enhanced opportunities to learn about and recreate there, especially enhanced paddling opportunities.

The fishing restrictions in the special recreation zone, combined with similar prohibitions and/or restrictions in waters outside the park boundary, could increase crowding in the few reef patches still open to fishing. This could be a long-term, moderate adverse impact to visitor experience of those fishermen.

Alternative 6 would have beneficial and adverse impacts, and when combined with the beneficial impacts of other actions, would result in beneficial cumulative impacts on visitor experience in the area. The contribution to the cumulative impacts of alternative 6 would be small.

Conclusion. Additional speed limitations and new noncombustion engine use zones would exclude some visitors from these areas, which would be a long-term, minor to moderate, adverse impact to some users. The same zones would help, over time, to separate conflicting visitor uses, increase boating safety, increase the quality of nonmotorized opportunities, and increase opportunities for solitude, which would be long-term beneficial impacts on some visitor experiences. Upgrades of visitor information, services, and facilities would be limited but result in a long-term beneficial impact on some visitor experiences. Both long-term, adverse, and beneficial impacts would occur to different visitors from implementing the special recreation zone. This alternative would have small contributions to the impacts of other actions, resulting in beneficial cumulative impacts on visitor experience in the area.

NPS OPERATIONS AND FACILITIES

This alternative would establish many new park zones that would require new staff and investment to plan and implement, which would be addressed through staff and funding proposed in the alternative.

Actions under alternative 6 would continue to concentrate park operations and facilities at Convoy Point and Porgy, Adams, Elliott, and Boca Chita Keys. These impacts include increased workloads associated with construction of new facilities, acquisition of new equipment, continuing maintenance of new facilities and equipment, contract oversight, and employment of additional staff.

The new special recreation zone as well as the expanded nature observation zone, slow speed zone, sensitive resource zone, and noncombustion engine use zone would require additional park staff time to educate park visitors and enforce new regulations. Implementation of the adaptive management strategy for the special recreation zone would require additional staff for monitoring,

issuance of fishing permits, and interagency coordination. It would also require additional capacity for enforcement, interpretation, education, and maintenance.

These actions would result in short-term, moderate, adverse impacts on the park because of equipment acquisition and construction management. There would also be long-term, minor, adverse impacts on the park because of the current lack of organizational capacity to undertake those tasks, but additional project and base funding would serve to mitigate those impacts. Creative use of partnerships and volunteers may also serve to bolster organizational capacity to undertake the proposed actions. After the initial implementation phase, and assuming adequate funding to meet existing and future park needs, this alternative could result in long-term efficiencies to park operations by reducing visitor conflicts and visitor-resource conflicts, which would be a long-term beneficial impact.

The special recreation zone would be implemented using an adaptive management strategy whereby resource conditions and fishing activities are monitored and management actions are reconsidered and adjusted on predefined intervals. These evaluation intervals at years 3, 5, and 8 would consider the need to potentially reduce the number of fishing permits to be issued for following years and the need to refine monitoring protocols to improve data quality for future evaluations. Over time, the size and abundance of fish in the special recreation zone is expected to increase during the adaptive management period. Also, the evaluation would consider adjustments to other management actions such as the location and number of mooring buoys and zone boundary markers, marine debris removal, public outreach efforts, and law enforcement efforts. Implementing these adaptive management actions would require additional organizational capacity, including staff and equipment. The potential adaptive management changes to be implemented in the zone also introduce an added complexity to otherwise routine park operations such as law enforcement, visitor education, and resource management. This would result in a short-term, minor impact to park operations.

Following the 10-year adaptive management period for the special recreation zone, the National Park Service would consider monitoring data and consult with the FWC, NOAA Fisheries, and an expert panel. At that point, the National Park Service would decide whether to continue adaptive management strategies for a special recreation zone or implement a marine reserve zone. The continuation of the special recreation zone would be predicated on monitoring data demonstrating a sufficiently improved resource condition and the expectation that the trend would continue. Where the decision is made to continue adaptive management and implementation of the special recreation zone, the impacts described above would be expected to continue. Where monitoring trends and indicator data show that management objectives are not being met, the marine reserve zone would be established to eliminate all fishing (except for the removal of exotic invasive species).

If the decision is made to convert to a marine reserve zone where fishing is not allowed, it would eliminate commercial and recreational fishing from its area of coral reef habitat. It is anticipated that commercial fishing would be phased out eventually in this area as provided for in the park's *Fishery Management Plan*, but implementation of a marine reserve zone would prohibit commercial and recreational fishing in this zone immediately, including the ballyhoo lampara net fishery, after passage of a special park regulation. Implementation of the marine reserve zone would result in short-term negligible to minor impacts to park operations during the first few years of implementation, but eventually those impacts would subside as park operations regarding the marine reserve zone normalize.

Assuming full funding, long-term impacts would be beneficial to park operations. Although under current funding reality and

trends, the impacts may be more severe to park operations.

Cumulative Impacts. As discussed under alternative 1, past and ongoing cooperative planning and development projects in the Biscayne Bay region, such as the Biscayne Bay Partnership Initiative, *Miami-Dade County Comprehensive Development Master Plan*, and *Biscayne Bay Strategic Access Plan*, and NPS special resource studies such as those for Miami Circle and Virginia Key Beach Park, have resulted in some long-term beneficial impacts on park operations and facilities. However, the impacts are almost impossible to measure.

This alternative, with its emphasis on strong natural and cultural resource protection, while providing a diversity of visitor experiences as well as establishment of potential visitor contact points outside the park, in combination with the aforementioned beneficial impacts of past and ongoing cooperative planning and development projects in the Biscayne Bay region, would generally result in long-term beneficial cumulative impacts on facilities and long-term, minor, adverse cumulative impacts on park operations. This alternative's contribution to these impacts would be beneficial for facilities and adverse for park operations.

Conclusion. Actions under alternative 6 would generally result in short-term, minor to moderate, adverse impacts on park operations during construction and implementation. There would also be long-term, minor adverse impacts that would be mitigated by increasing organizational capacity. Over time, the resolution of long-standing visitor use issues and conflicts would result in beneficial impacts to park operations. The overall cumulative impacts would be long term and beneficial for facilities and long term, negligible, and adverse for park operations. This alternative's contribution to these impacts would be small and beneficial for facilities and minor and adverse for park operations.

SOCIOECONOMIC ENVIRONMENT

Full implementation of this alternative would require 19 additional full-time equivalent staff positions to handle the increased workload for interpretation, cultural resource management, natural resource management, law enforcement, administrative support, and maintenance. Any additional employment along with the federal dollars that would be required to implement this alternative is expected to have a long-term beneficial impact on the regional economy.

Under this alternative, visitors would continue to have unrestricted access (multiuse zone) to most of the park's waters (approximately 83%) and would be able to engage in a wide range of recreational activities. Adverse impacts now occurring on fishery resources and habitat in the park would be reduced under this alternative due to the additions of slow speed, noncombustion, sensitive resource, and nature observation zones. It has been estimated that Biscayne Bay-related recreational activities created $3.8 billion in economic output, $2.1 billion in incomes, and 57,000 jobs (Hazen and Sawyer 2005). However, there are indications that Biscayne Bay is showing a decreased capacity, or resilience, to withstand external pressures which may affect the bay's long-term health, and its environmental and economic sustainability (Adams and Blair 2014). These zones would help over time to separate conflicting visitor uses, increase boating safety, and increase nonmotorized recreational opportunities. Economic studies beginning with Fisher and Krutilla (1972), Cichetti and Smith (1973, 1976), Prince and Ahmed (1988) have shown that congestion will cause recreationists to adjust their length of visit and satisfaction with their recreation experiences. The expected long-term beneficial impacts on park fishery resources and habitat as well as on some visitors' experiences associated with the implementation of these zones would result in a long-term beneficial impact on the

sustainability of local tourism and resource-based economic activities. The proposed visitor services and facilities improvements would enhance the range and quality of recreational and interpretive opportunities available throughout the park, which has the potential to improve visitors' park experience and satisfaction and possibly increase the number of visitors and average length of park visit.

Implementing alternative 6 would result in the creation of a special recreation zone, which is an area where some types of fish harvest would be prohibited and the number of fishing permits within this area would be limited. With the exception of lampara net commercial fishing operations for ballyhoo, which would be allowed in the special recreation zone, this would have an adverse impact on commercial fishing as this activity would have to occur elsewhere in or out of the park. The zone in this alternative would comprise about 8% of the park. The impact would be expected to be long term, negligible, and adverse.

The special recreation zone would be implemented using an adaptive management strategy whereby resource conditions and fishing activities are monitored and management actions are reconsidered and adjusted on pre-defined intervals. Over time, the anticipated reduction in fishing pressure in this zone, where targeted fish species could grow larger and therefore increase in reproductive output, would be expected to result in a long-term, beneficial impacts on recreational fishing and associated service-related sectors. Even though fishing pressure may increase outside this zone, the expected increase in size and abundance of fish within the marine reserve zone is expected to have a spillover effect as documented in other marine reserve zones worldwide.

If the decision is made to convert to a marine reserve zone where fishing is not allowed, it would eliminate commercial and recreational fishing from its area of coral reef habitat. It is anticipated that commercial fishing would be phased out eventually in this area as provided for in the *Fishery Management Plan*, but implementation of a marine reserve zone would prohibit commercial and recreational fishing in this zone immediately, including the ballyhoo lampara net fishery, after passage of a special park regulation. Implementation of the marine reserve zone would result in long-term, minor adverse impact to commercial fishing as this activity would have to occur elsewhere in or out of the park. Termination of commercial fishing, whether immediately, at 10 years, or over time, would be a localized, long-term, minor adverse impact to commercial fishing in South Florida.

Nonconsumptive recreation benefits, such as snorkeling and scuba diving, would be further allowed in the proposed marine reserve zone. Economic studies have shown that snorkelers and scuba divers would increase trips with improvements in fish abundance, water visibility, and coral quality (Bhat 2003), all of which are expected to occur under this alternative, but to a lesser extent than alternatives 3, 4, and 5. An increase in recreational scuba diving may increase coral reef damage due to a higher frequency of diver-coral contacts (Chadwick-Furman 1997; Krieger and Chadwick 2012). This would require an increased ecotourism management strategy to specifically educate divers about the extra care needed when recreating around coral reefs. Due to a shift in visitation pattern, the net impact in the number of visitors or average length of visit would be expected to be negligible. Therefore, under this alternative it is expected there would be no impact on tourism-related businesses.

Similar to the no-action alternative, the continued presence of Biscayne National Park positively contributes to the value of surrounding private land.

Cumulative Impacts. Impacts associated with past and ongoing partnership and planning efforts, presence of nearby recreational opportunities and expanded developed area according to city and county plan with its associated population and park

visitation increase would be similar to those described under alternative 1.

The proposed actions of this alternative to improve access and recreational opportunities and facilities, as well as the satellite visitor information sites, would support regional efforts in enhancing tourism and increasing visitor access and recreational opportunities in the area. The continuation of adverse impacts on submerged aquatic species, especially park coral reefs, has the potential to result in long-term, minor, adverse impacts on the economic benefits derived from these resources. This alternative, when combined with the impacts of other actions, would result in beneficial cumulative impacts on the regional socioeconomic environment.

The expected improvement in quality of visitor activities especially related to fishing, nature viewing, and other resource-based recreational activities resulting from zoning changes proposed in this alternative such as slow speed, noncombustion engine use, sensitive resource, and nature observation zones, combine with ongoing regional efforts, would have the potential to improve the regional socioeconomic environment—a long-term beneficial impact.

The long-term socioeconomic impacts of phasing out commercial fishing in the park are expected to be realized with the anticipated implementation of the *Fishery Management Plan* and are assessed in that plan. For more information on the *Fishery Management Plan*, please visit http://www.nps.gov/bisc /parkmgmt/fishery-management-plan.htm.

Alternative 6 would contribute a small increment to the above impacts of other past, present, and future actions on socioeconomic conditions and when considered in combination with other actions would result in a beneficial cumulative impact.

Conclusion. The strong protection of natural and cultural resources that is expected to enhance resource conditions would have a long-term beneficial impact to the regional socioeconomic environment. Upgrades in park visitor services and facilities would support regional efforts to enhance tourism and increase visitor access and recreational opportunities in the area. The conversion of the special recreation zone to a marine reserve zone would result in long-term, negligible, adverse impacts to commercial fishing as fishing would have to occur elsewhere in or out of the park. There would be long-term beneficial impacts on snorkeling- and scuba diving-related businesses from the continuation of nonconsumptive recreation uses in the special recreation area. The expected spillover effect, where targeted fish species could grow larger and therefore increase in reproductive output, would generally contribute to long-term, beneficial impacts on recreational fishing and associated service-related sectors. The overall cumulative impacts would be beneficial with this alternative contributing a small increment.

UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts are defined here as impacts that cannot be fully mitigated or avoided.

Existing moderate or major adverse impacts to fishery resources, federally listed sea turtles, smalltooth sawfish, stony corals, submerged aquatic communities, and natural soundscapes would be expected to continue in the majority of park waters included in the multiuse zone. These impacts are primarily caused by the relatively unrestricted use of motorized boats as well as fishing and marine debris that continue to impact most park waters and submerged habitats.

New actions proposed under this alternative would reduce some or all of those impacts to many of the most sensitive areas of park waters. Thus, there would be no new unavoidable moderate or major adverse impacts expected as a result of implementing alternative 6.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Alternative 6 would have a small potential for some commitments of resources because it would involve a minimum of new development (e.g., trails, primitive dock, marine signage). However, most of the development being proposed is minimal, such as trails with only small areas of potential impact. Most proposed development would be built in previously disturbed areas, so would not result in irreversible or irretrievable commitments of resources. Cultural resources would continue to be protected through active preservation maintenance.

NATURAL OR DEPLETABLE RESOURCES AND ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

Whenever feasible, the National Park Service strives to maximize the use of renewable resources and energy and therefore minimize the use of depletable resources. However, it is not possible with today's technologies to cost-effectively avoid all use of depletable resources in building and operating facilities.

Implementing alternative 6 would involve minimal increase in energy requirements.

IMPACTS OF IMPLEMENTING ALTERNATIVE 7

NATURAL RESOURCES

Fishery Resources

Fishery impacts to all zones except the special recreation zone are the same as those described in alternative 6.

There would be an increase in the number of people fishing from the shoreline if a new boardwalk was built facing the bay waters. This would be expected to have a long-term, negligible, adverse impact on park fishery resources.

Adverse impacts to fishery resources in the special recreation zone would be similar to those described in alternative 6, except the impacts associated with bycatch would be absent for four months of the year. In addition, the beneficial impacts would be intensified because angler access would be closed June through September when water temperatures peak. At these increased temperatures, oxygen solubility is decreased, fish are more easily fatigued, and a caught fish is less likely to recover if it were released. Thus, this closure would allow a greater protection to reef fish during a time when they are already stressed by environmental extremes (Bartholomew and Bohnsack 2005; Wooton 1992). Thus, there are potentially greater benefits to park fishery resources to be realized in a summer seasonal fishing closure than in reduced fishing pressure year-round.

All the commercial fishing activities that currently occur in the special recreation zone are part of the activities analyzed in the *Fishery Management Plan*, including a phase out of all commercial fishing over time.

Within the special recreation zone, almost all commercial fishing would be prohibited immediately by special regulation with the exception of the ballyhoo lampara net fishery. That one fishery would continue during the adaptive management period but may still be prohibited after 10 years if the decision is made to convert to a marine reserve zone. Prohibition of commercial fishing, whether immediately, at 10 years, or over time, would be a beneficial impact to park fishery resources and fish habitat and the benefit would be greater the sooner the prohibition occurs.

This alternative would provide a greater benefit to fishery resource habitat in the seagrass than alternative 1 because a larger area for seagrass beds in the park would be included in protective zoning designation.

These zones include the noncombustion engine use zone, the slow speed zone, and the marine reserve zone, all of which contain seagrass beds.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be the similar to alternative 1. The reduction of adverse impacts from human activities on coral reefs and associated ecosystems, combined with efforts from the United States Coral Reef Task Force, would generally result in beneficial impacts. However, the intensity and duration of the cumulative impact of the above planning efforts would depend on the actual number and type of actions taken to implement the identified fundamental themes.

The fishing restrictions in the special recreation zone, combined with similar prohibitions and/or restrictions in waters outside of the park boundary, could increase fishing pressure and related impacts of overfishing and marine debris in the few reef patches still open to fishing. This could be a long-term, moderate adverse impact to those overfished reefs, but the overall impact to fish populations and fish habitat would be mitigated by the protection of prime reefs that

serve as nursery grounds to maintain populations of fish species.

This alternative would contribute a beneficial impact to the beneficial impacts of other past, present, and future actions resulting in beneficial cumulative impacts.

Conclusion. Adverse impacts now occurring on fishery resources and fish habitat in the park would persist in most of the park. These impacts would be reduced in the special recreation zone resulting in a long-term beneficial impact to fish and fish habitat in some locations. Cumulative impacts would be beneficial. This alternative's contribution to these impacts would be minor. This alternative would have no new adverse impacts from proposed management actions.

Threatened and Endangered Species

Manatee. Manatees are more likely to be found in the warm waters nearest the shore, so the 1,000-foot-wide slow speed zone adjacent to the entire length of the mainland shoreline would provide protection for manatees in this area. The slow speed zone would provide boat operators a greater opportunity to avoid collisions with manatees by increasing their response time. The expanded slow speed zone under this alternative would also result in fewer boat groundings in seagrass beds, an important habitat/food source for manatees.

The modifications to the manatee protection area and zoning would have a long-term beneficial impact on manatees and manatee habitat in the park.

Section 7 Determination of Effect— Measurable beneficial outcomes on individual manatees and the manatee population because of the protective zones are likely. The determination of effect is "may affect, not likely to adversely affect" for manatee under alternative 7.

Sea Turtles. In the waters of the multiuse zone (water), impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include the potential for collisions with boats, strangulation and entanglement with marine debris (including lobster and crab traps), hook-and-line fishing, and vessel groundings on sea turtle foraging habitat (coral and seagrass), which may adversely affect sea turtles, particularly loggerhead, hawksbill, and green species. Leatherback and Kemp's Ridley would be less likely to be affected because they are rarely in the park. These impacts would continue to be long term, minor to moderate, and adverse.

Collisions between boats and sea turtles would be expected to be minimized in the slow speed and the noncombustion engine use zones.

The implementation of a special recreation zone would result in less impact from fishing activities and from derelict fishing gear (monofilament, traps) in this area. This would result in the reduction of threat of entanglement for sea turtles within this zone. This would be a beneficial, long-term impact on sea turtles in and near that zone.

Studies in Florida and other areas in the world have shown that artificial light adversely impacts sea turtle nesting. Light on Elliott Key is primarily generated from park service facilities, campground, and visitor harbor, all on the bay side of the island. This light does not reach the nesting beaches that are on the ocean side of the island. Any light generated by campers in the group campsite, located on the ocean side of Elliott Key, would be minimal and unlikely to reach sea turtle nesting beaches. Development on Elliott Key would be minimal because only the Breezeway Loop Trail and boardwalk would be improved. There would not be a substantial amount of light from the campsites. Mitigation measures such as education efforts regarding the importance of reducing artificial light, additional monitoring and patrols as visitation increases, and possibly limitations on the number of visitors would reduce the level of adverse impacts. The improvement of

the existing trail on Elliott Key could increase the number of visitors that venture to the beaches where the turtles tend to nest. This could require that the park change the management of this area to minimize disturbance to the turtles. Additional mitigation measures could also include increased visitor education and increased monitoring throughout the park and particularly in areas near turtle nesting areas. With mitigation, the impacts would be long term and adverse but negligible.

Section 7 Determination of Effect— Impacts to sea turtles from fishing and boating would persist in most of the park, resulting in a determination of "may affect, likely to adversely Affect" for loggerhead, hawksbill, and green species that frequent the park waters.

American Crocodile. Most visitor services and infrastructure in habitat suitable for crocodile would remain near current levels with the designated paths, with the exception of a possible viewing platform and boardwalk in the vicinity of Convoy Point. This area is north of the designated critical habitat area for crocodiles and so would not be expected to impact their activities in the park. The mangrove south of the visitor center would continue to be managed primarily to protect the natural habitat characteristics of the area. No additional development within the designated critical habitat would be proposed under this alternative. The impacts of activities on crocodile habitat and activities along the mainland shore would be long-term, negligible and adverse.

Under this alternative, a canoe and kayak dock would be built on Porgy Key, but this would only slightly increase the development footprint on this island. The noncombustion engine use zone would include the eastern shoreline of Old Rhodes Key and the waters around Totten Key so relatively few visitors would be expected in this area because of the boating limitations. Although in designated critical habitat, there are relatively few crocodiles in this area of the park.

If population of crocodiles were to increase within the park, there could be increased interaction between visitors and crocodiles. The developed area at Adams Key provides an excellent opportunity to orient visitors to designated critical habitat for crocodiles, including appropriate actions when traveling in crocodile habitat. With mitigation, the long-term adverse impact of this alternative on the crocodile population in this area of the park would be negligible.

As a whole, the park protects habitat for the crocodile and serves to further its conservation through education and law enforcement, resulting in long-term beneficial impacts on this species.

Section 7 Determination of Effect— The long-term impacts on the American crocodile under alternative 7 would be both beneficial due to habitat protection and education as well as negligible and adverse in localized areas. Mitigation measures would be put in place in the event of more human-crocodile interactions. Overall, this would equate to a "may affect, not likely to adversely affect" determination for the American crocodile.

Smalltooth Sawfish. Adverse impacts to smalltooth sawfish would be the same as described in alternative 6 for all zones expect the special recreation zone.

Adverse impacts to smalltooth sawfish in the special recreation zone would be similar to those described in alternative 6, except impacts associated with bycatch (a known cause of mortality) would be absent for four months of the year. In addition, beneficial impacts would be intensified because angler access would be closed June through September when water temperatures peak. At these increased temperatures, oxygen solubility is decreased, fish are more easily fatigued, and a caught fish is less likely to recover if it were released. Thus, this closure would allow a greater protection to smalltooth swordfish during a time when their habitat is already stressed by environmental extremes (Bartholomew and Bohnsack 2005; Wooton

1992). Thus, there are greater benefits to smalltooth sawfish to be realized in a summer seasonal fishing closure than in reduced fishing pressure year-round.

Section 7 Determination of Effect— no actions in this alternative would adversely affect the smalltooth sawfish and there could be a reduction in potential hook-and-line catches due to the seasonal fishing closure in the special recreation zone, but moderate adverse impacts from fishing in most park waters persist. The section 7 effect determination would be "May affect, likely to adversely affect."

Schaus Swallowtail Butterfly and Miami Blue Butterfly. New development on Adams Key where butterfly habitat exists would be limited in scale to include only the staging area for paddlecraft and possibly minimal facilities for the environmental education center. The level of development on the island would occur near the shore where the habitat is less suitable for butterflies and would be unlikely to impact the butterfly population or habitat on the island. The impacts would be long term, negligible, and adverse.

On Elliott Key, the existing Breezeway Loop Trail and boardwalk would be made accessible, but this change would probably not alter its footprint or measurably increase visitor use. During improvement activities, the area would be checked by a qualified biologist to ensure that no individuals or preferred nectar or host plants would be disturbed. As a result, the potential disturbance of the butterfly population or habitat would be slight. The impacts would be long term, negligible, and adverse.

Old Rhodes and the other southern keys would be zoned for nature observation, and Swan Key and Soldier Key would be zoned as a sensitive resource area. Impacts on the hardwood hammocks on these keys would not change under this alternative. There would be no impacts on butterfly populations and habitat caused by this alternative. Continued protection of butterfly habitat on these keys would generally be a beneficial impact to these butterfly species.

Section 7 Determination of Effect— The impacts on the Schaus swallowtail butterfly and the Miami blue butterfly would be both beneficial and long term, negligible and adverse in some locations, but mitigation measures to protect the species' habitat and breeding season are likely to be successful. Overall, the determination of effect for alternative 7 is "may affect, not likely to adversely affect" the Schaus swallowtail butterfly and the Miami blue butterfly.

Stony Corals. Adverse impacts to stony corals would be the same as described in alternative 6 for all zones except for the special recreation zone.

Adverse impacts to stony corals in the special recreation zone would be similar to those described in alternative 6, with the possible difference that fishing-related marine debris might be lessened, resulting in beneficial impacts to stony corals.

Section 7 Determination of Effect— The special recreation zone in alternative 7 is expected to have a beneficial, long-term, effect on corals by protecting them from activities that could lead to physical and ecological damage, but such impacts would persist in most of the park. Thus, this alternative would result in a determination of "may affect, likely to adversely affect" stony corals.

Cumulative Impacts. Habitat disturbance or loss is the most common reason for a species to be listed. The establishment of Biscayne National Park has provided a protective refuge for listed species resulting in long-term beneficial impacts.

The *Florida Manatee Recovery Plan* and the site-specific county plans are designed in part to reduce boat-related manatee injury and mortality as well as protect habitat areas. These measures are consistent with protection measures incorporated into the proposed

actions in this *Final General Management Plan / Environmental Impact Statement*. Implementation of this recovery plan would continue to have a beneficial impact on manatee protection efforts in the park. The efforts to protect the manatee would be strengthened under this alternative with the establishment of a slow speed zone for 1,000 feet of the mainland shoreline. The impacts of this action would continue to have a beneficial impact on manatee protection efforts.

Reintroduction efforts of Miami blue butterflies have occurred on Elliott Key in an attempt to restore this species. If successful, this would be a long-term beneficial impact. The monitoring and recovery plan would continue to be implemented.

Alternative 7 would result in negligible adverse and beneficial impacts on federally listed species. When combined with the impacts of other past, present, and future actions the overall cumulative effect would be beneficial. This alternative would contribute a slight amount to the overall cumulative effects.

Conclusion. Existing impacts on listed species and their habitat would persist in much of the park. Some impacts would be reduced through changes in zoning, which would be expected to have localized beneficial impacts. Under this alternative, there would be proposed small-scale development (a canoe and kayak dock at Porgy Key and hardening trails at Elliott Key) that could have long-term negligible adverse impacts on habitats used by American crocodiles, sea turtles, and butterflies. The park would continue to coordinate with the U.S. Fish and Wildlife Service and NOAA Fisheries and work to avoid and mitigate any adverse impacts on these species. Thus, the section 7 determination would be that this alternative "may affect, for those for those species. However, existing impacts to sea turtles, smalltooth sawfish, and stony corals would continue to be long term, moderate and adverse and would result in a "may affect, likely to adversely affect" determination although there are no new impacts to these species associated with any proposed actions. Cumulative effects would be negligible to beneficial. This alternative would contribute a small amount to the overall cumulative effects.

This alternative would have a long-term beneficial impact on manatees due to slow speed and noncombustion engine use zones. It would also have long-term, beneficial impacts to sea turtles, smalltooth sawfish, and stony corals in the special recreation zone, but to a lesser extent than in the marine reserve zone in alternatives 3, 4, and 5 due to continued fishing. There would be greater physical protection of stony corals due to exclusion of traps within the special recreation zone.

Special Status Species, including State Listed Species

Birds that eat small fish near the water's surface would continue to be impacted in the short term by the continuation of the ballyhoo lampara net commercial fishery that would reduce potential food sources for those bird species. All the commercial fishing activities that would occur now in the special recreation zone are part of the activities analyzed in the *Fishery Management Plan*, including a phase-out of all commercial fishing over time. Within the special recreation zone, almost all commercial fishing would be terminated immediately by special regulation with the exception of the ballyhoo lampara net fishery. That one fishery would continue during the adaptive management period but may still be terminated after 10 years if the decision is made to convert to a marine reserve zone. Termination of commercial fishing, whether immediately, at 10 years, or over time, would be a very beneficial impact to park fishery resources and the bird species that use them for food. The benefit would be greater the sooner the termination occurs.

Arsenicker Key and West Arsenicker Key host wading bird colonies including state listed wading birds and state listed white-crowned

pigeons; West Arsenicker also hosts nesting bald eagles. These keys would be zoned sensitive resource zones and would remain closed to visitors. Furthermore, extending the sensitive resource zone 300 feet into the water around West Arsenicker and Arsenicker Keys would further reduce the likelihood of disturbances to bald eagles, white-crowned pigeons or any other state listed wading birds using these islands. There is currently a bald eagle nest on the mainland shoreline south of Black Point. The establishment of a slow speed zone extending 300 feet off the mainland shoreline into the bay waters is expected to provide a level of protection to this area that already has low visitation.

Under this alternative, the islands surrounding Jones Lagoon would be zoned nature observation zones. The small islands within Jones Lagoon and a 300-foot buffer around these islands and Soldier Key would be zoned sensitive resource zones. Most of the waters of Jones Lagoon would be designated a noncombustion engine use zone. Visitation would be allowed within Jones Lagoon and its surrounding islands, so there would be some potential human-caused intrusions to birds nesting, roosting, loafing, and/or foraging there; however, resource protection would be emphasized. Actions under alternative 6 would reduce, although not eliminate, the potential for disturbance to birds using the Jones Lagoon area because there is still the possibility that small vessels (e.g., paddlecraft) and people coming ashore could closely approach the birds. Actions under alternatives 6 and 7 would reduce, although not eliminate, the potential for disturbance to birds using Soldier Key and the Jones Lagoon area because there is still the possibility that small vessels (e.g., paddlecraft) in Jones Lagoon and motor vessels by Soldier Key would approach birds due to low NPS presence within these areas.

The establishment of a visitor services zone on Porgy Key could encourage visitation to the Jones Lagoon area, although the difficulty in accessing this area and the specialized equipment and knowledge needed to safely traverse Jones Lagoon would keep the likelihood of this fairly low. Similarly, access to Soldier Key is also challenging given the shallow waters. Given that visitation to Jones Lagoon and Soldier Key would be expected to remain minimal, adverse impacts on the birds and their habitat would be negligible. If visitation increases such that any state listed birds could be disturbed, management actions could include limiting access to areas where birds are known to nest during nesting season and/or establishing set-back distances following recommendations in scientific literature because human disturbance has the potential for nesting birds to inadvertently crush their eggs while fleeing or to temporarily or permanently abandon their nests, thereby exposing the eggs to predators and extreme temperatures. Under this alternative, not all wading bird colonies would have protective zoning to reduce human disturbance, so the long-term adverse impact on the state listed bird populations in the park would be negligible.

The proposed slow speed zone on the bay side of Elliott Key would be expected to reduce the likelihood of disruptions to birds using the coastal areas immediately adjacent to this zone. As a result, beneficial effects on state listed birds in the immediate area would be expected.

Under this alternative, birds using coastal habitats along the park's mainland shoreline would receive protection from potential boat-related disturbances from a slow speed zone covering the area 1,000 feet from the mainland shoreline. By reducing the speed of boats in the waters immediately adjacent to the mainland shoreline, potential boat-related disturbances are expected to be reduced for birds that are roosting, nesting, foraging, and/or loafing along the mainland shoreline. Some birds may still experience disturbance from noise associated with motorized watercraft in this zone, even though boats would be operating at slower speeds.

Overall, this alternative, including any necessary mitigation, would probably result in

long-term, negligible, adverse impacts due to proposed development in this alternative. There would be beneficial impacts on state listed bird populations and nesting activity in the park due to the establishment of protective zones around the above-mentioned keys.

Cumulative Impacts. Large-scale habitat loss is an ongoing impact throughout the region, which resulted in the classification of many bird species as state listed. The establishment of Biscayne National Park has provided increased habitat protection for bald eagles and other state listed birds in the park—a long-term beneficial impact.

Alternative 7 would result in negligible impacts on listed birds due to increased visitor use and construction of minor visitor facilities. When combined with the impacts of other past, present, and future actions, the overall cumulative effect would be minor and adverse. This alternative would have a small contribution to the overall cumulative effects.

Conclusion. Under this alternative, there would be proposed development that could result in long-term, negligible, adverse impacts on state listed species and would not be likely to lead to federal listing. There would be beneficial impacts to state listed birds through protective zoning that would reduce the likelihood of disturbance in important bird habitats caused by visitor activities.

Terrestrial Vegetation

Under this alternative, the impacts on terrestrial vegetation on the keys, particularly the hardwood hammocks, would occur due to localized construction of minor visitor facilities and continued visitor use. Visitation to the keys would still be expected to increase over current levels because visitor services would be concentrated in these areas. The adverse impacts from increased visitation could include trampling and loss of vegetation from social trails. In general, these impacts could be mitigated by visitor education efforts and trail design to keep visitors on the existing trails. With mitigation measures in place, the impacts would be long term, negligible to minor and adverse. Under this alternative, the existing Breezeway Loop Trail and boardwalk would be hardened to provide universal access. With mitigation, the localized impacts on vegetation would be long term, negligible and adverse.

Long-term impacts from the proposed Convoy Point boardwalk would include the removal of mangroves and other wetland plants, trimming mangroves, and would have shading impacts on mangroves and other vegetation. Localized impacts would be long term, minor, and adverse.

Under this alternative, much of the mainland shoreline, Sands Key, and the islands surrounding Jones Lagoon would be zoned as nature observation zones and visitation would be allowed, however protection would be emphasized. This expected to have a long-term beneficial impact on terrestrial vegetation on these islands.

Cumulative Impacts. An exotic plant management plan has been developed for Biscayne National Park and eight other national parks in the region. Exotic invasive plant species can change the structure and function of native plant communities. These changes can have an adverse impact on habitat for native species that rely on native plant communities. Vegetation disturbances caused by social trails and trampling of native vegetation encourages growth of invasive species. Removal of nonnative species would provide better conditions to reestablish native vegetation in disturbed areas, which could help mitigate the adverse impacts associated with social trails in the park. Implementation of this plant management plan would have a beneficial impact on terrestrial vegetation in the park and the habitat it provides.

When the negligible to minor adverse impacts of alternative 7 are combined with the beneficial impacts of other past, present, and future actions, the resulting cumulative

impacts would continue to be beneficial. This alternative would slightly reduce these beneficial cumulative impacts.

Conclusion. Implementing this alternative would result in long-term, negligible to minor adverse impacts on terrestrial vegetation in localized areas associated with minor construction projects and continued or increasing visitor use. Cumulative impacts would be beneficial. This alternative would slightly reduce these beneficial cumulative impacts. Adverse impacts would be less than alternative 2 due to the smaller footprint of trail improvements on Elliott Key.

Wetlands

Wetlands in the park would continue to serve as an important habitat area for a wide variety of terrestrial and aquatic species. Placement of the nature observation zone and the slow speed zone in open water along the mainland shoreline along portions of the mainland would give greater protection to mangrove shorelines. This would have long-term, beneficial impacts.

Under this alternative, construction of a boardwalk or viewing platform would be considered to interpret the mangrove forests and the mangrove shoreline north of the visitor center at Convoy Point; also, the visitor center boardwalk and jetty could be upgraded. With these improvements, visitors would have an opportunity to experience the mangroves along the shore north of the visitor center at Convoy Point. Construction of the boardwalk and viewing platform would cause both short-term and long-term adverse impacts on the mangroves along the mainland shoreline of the park. During construction, there would be short-term adverse impacts on water quality from increased turbidity. Increased turbidity in the water column could degrade the habitat for wetland plant species. These localized impacts would be short-term, minor to moderate, and adverse.

Long-term impacts from the proposed boardwalk might include removal of some mangroves and other wetland plants, trimming mangroves, and shading mangroves and other aquatic life. Impacts would be long-term, minor, and adverse. These impacts could be mitigated during the design process to ensure that the structures do not substantially shade the mangroves.

No additional access into the mangroves that fringe the keys would be developed under this alternative so there would be no change in the current size, integrity, or continuity of these other wetland areas in the park. Mangroves are extremely difficult to walk through, and while the proposed visitor facility improvements at Porgy, Elliott, and Boca Chita Keys might attract more visitors—this is not likely to affect the wetlands.

Cumulative Impacts. The Biscayne Bay Coastal Wetlands Project of the Comprehensive Everglades Restoration Plan includes pump stations, spreader swales, stormwater treatment areas, flow ways, levees, culverts, and backfilled canals in southeast Miami-Dade County and covers 13,600 acres from the Deering Estate south to the Turkey Point Power Plant. The purpose of this project is to rehydrate wetlands and reduce point source discharge into Biscayne Bay. The proposed project would replace lost overland flow and partially compensate for the reduction in groundwater seepage by redistribution through a spreader system, with available surface water entering the area from regional canals. The proposed redistribution of freshwater flow across a broad front is expected to restore or enhance freshwater wetlands, tidal wetlands, and nearshore bay habitat.

Sustained lower-than-seawater salinities are required in tidal wetlands and the nearshore bay to provide nursery habitat for fish and shellfish. This project is expected to create conditions that would be conducive to the reestablishment of oysters and other components of the oyster reef community. Diversion of canal discharges into coastal

wetlands is expected not only to reestablish productive nursery habitat along the shoreline, but also to reduce the abrupt freshwater discharges that are physiologically stressful to fish and benthic invertebrates in the bay near canal outlets. The impact of these actions once implemented would be beneficial for wetlands inside and outside the park.

The Biscayne Bay Coastal Wetlands Project could improve the overall health of the wetland areas along the mainland shoreline such that the system as a whole is better able to accommodate the stresses associated with the short- and long-term impacts of the development and human use in the area.

This alternative would contribute minor adverse impacts to the beneficial impacts of other present and future actions resulting in a beneficial cumulative impact. This alternative would slightly reduce these beneficial cumulative impacts in localized areas.

Conclusion. Localized impacts associated with construction under this alternative would be short term, minor to moderate adverse. The long-term impacts of the new facilities would be mitigated through design and would be adverse and minor. Cumulative impacts would be beneficial. This alternative would slightly reduce these beneficial cumulative impacts.

Submerged Aquatic Communities

In the waters of the multiuse zone, impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include impacts on submerged aquatic communities caused by boating and fishing and associated marine debris. These impacts would continue to be long term, minor to moderate, and adverse.

Under this alternative, there would be greater controls on speed and vessel types in areas where there are submerged aquatic communities, particularly seagrass beds. The West, Middle, and East Featherbed Banks, the waters around Jones Lagoon would be zoned for noncombustion engine use (poling and trolling only). Boats in this zone would be traveling relatively slowly, and fewer boats would be operating with high-speed propellers so the potential for scarring of seagrass beds and hardbottom communities would be substantially reduced. Within the noncombustion engine use zone, the potential for turbidity in the water column caused by motorboats would also be reduced. Thus, the health of the seagrass beds would be higher under this alternative—a long-term beneficial impact.

The bay side of Elliott Key from Sands Cut to Elliott Key Harbor and a strip along the mainland shore from 1,000 feet out would be zoned as a slow speed area to protect natural marine resources such as seagrass. Because the boats in these areas would be traveling at a reduced rate of speed, there would be reduced potential for seagrass scarring.

Under this alternative, a special recreation zone would be designated from Hawk Channel east to the park boundary from 2 miles south of Pacific Reef to north of Long Reef. The special recreation zone includes limitations that accommodate some recreational fishing while meeting the goal of providing a healthy coral reef ecosystem for a more enjoyable and diverse visitor experience. Fishing activities would be restricted to protect resources in this zone, but some fishing would still occur that could result in marine debris and conflicts with other users. It would be expected that the adverse impacts on the reef from fishing-related activities would be reduced under this alternative compared to alternative 1, but not eliminated. In particular, the prohibition on anchoring would reduce the potential for scarring, but there could still be ecological adverse impacts from allowing some fishing and other currently existing recreational activities such as scuba diving. There would still be potential impacts to submerged aquatic communities in this zone due to vessel groundings and reef breakage or damage caused by currently existing scuba diving activities (Barker and

Roberts 2004; Hall 2001; Medio et al. 1997). Implementation of the special recreation zone would generally reduce the impacts of recreational activities in this area of the reef due to exclusion of traps within this zone, resulting in a long-term beneficial impact. Moderate, adverse impacts from fishing and anchoring would continue outside the special recreation zone.

The special recreation zone would be implemented using an adaptive management strategy whereby resource conditions and fishing activities are monitored and management actions are reconsidered and adjusted on pre-defined intervals. These evaluation intervals at years 3, 5, and 8 would consider the need to potentially reduce the number of fishing permits to be issued for following years and the need to refine monitoring protocols to improve data quality for future evaluations. Also, the evaluation would consider adjustments to other management actions such as the location and number of mooring buoys and zone boundary markers, marine debris removal, public outreach efforts, and law enforcement efforts. Implementing these adaptive management actions, particularly a reduction in fishing permits issued and removal of marine debris, would be expected to have beneficial impacts on submerged aquatic communities including corals and seagrass beds. However, the addition of or relocation of mooring buoys and boundary markers would result in short-term, minor adverse impacts in specific areas associated with underwater installation and associated impacts to submerged substrates, although mooring buoys and boundary markers would be placed away from corals, seagrass beds, and submerged cultural resources. Increased public outreach and/or law enforcement efforts would probably reduce the potential for illegal anchoring that could impact submerged aquatic communities and thus is a beneficial impact. Also, any changes in the monitoring protocol that increases the number or frequency of extractive samples for destructive analysis could have short-term, minor adverse impacts on submerged habitats in general although sensitive submerged aquatic communities would not be targeted for such sampling. Likewise, monitoring protocols that require installed markers or in situ equipment could have localized negligible adverse impacts to the area around those sites and in considering placement of such markers and equipment every effort would be made to avoid impacts to corals and seagrass beds and thus the impact would be negligible or nonexistent. Additional analysis and agency consultation, as appropriate, would be conducted when site-specific location information has been adequately identified.

Following the 10-year adaptive management period for the special recreation zone, the National Park Service would consider monitoring data and consult with the FWC, NOAA Fisheries, and an expert panel. At that point, the National Park Service would decide whether to continue adaptive management strategies for a special recreation zone or implement a marine reserve zone. The continuation of the special recreation zone would be predicated on the monitoring data demonstrating a sufficiently improved resource condition and the expectation that the trend would continue. Where the decision is made to continue adaptive management and implementation of the special recreation zone, the impacts described above would be expected to continue. Where monitoring trends and indicator data show that management objectives are not being met, the marine reserve zone would be established to eliminate all fishing (except for the removal of exotic invasive species). If the decision is made to convert to a marine reserve zone where fishing is not allowed, it would eliminate commercial and recreational fishing from its area of coral reef habitat. It is anticipated that commercial fishing would be phased out eventually in this area as provided for in the park's *Fishery Management Plan*, but implementation of a marine reserve zone would prohibit commercial and recreational fishing in this zone immediately, including the ballyhoo lampara net fishery, after passage of a park special regulation. This locally reduced fishing pressure, where targeted fish species

could grow larger and therefore increase in reproductive output, would result in a long-term, beneficial impact on the submerged aquatic habitats.

Overall, the health of the seagrass beds would be expected to increase under this alternative because of the increased areas zoned for slow speeds and noncombustion engines. The increase in the health of seagrass beds would be a long-term beneficial impact.

Cumulative Impacts. Boat groundings and anchoring have damaged seagrass beds, coral reefs, and hardbottom communities, and degraded habitat for fish, shrimp, crabs, lobsters, and other invertebrates that inhabit these areas.

Coral reefs are complex ecosystems and sensitive to disturbances. Fishing, snorkeling, and scuba diving can also have adverse impacts on coral reef systems. The damage caused by these activities includes scarring from boat propellers and inadvertent placement of anchors, as well as breakage caused by snorkeling and scuba diving. Fishing gear and debris can break, smother, and entangle benthic resources on coral reefs and in seagrass meadows. Fishing also results in removal of predators and the removal of herbivorous fish that keep algae minimized (contributes to reef health). Damage to the coral reefs also adversely impacts other species that rely on the reefs for food and shelter. Damage to the seagrass beds, hardbottom communities, and coral reefs would continue to be a long term, minor to moderate, and adverse impact.

Alternative 7 would reduce some of the existing impacts associated with recreational and commercial boating and fishing use, which result in long-term beneficial impacts. When combined with the adverse impacts of other past, present, and future actions, the cumulative impacts would be minor to moderate and adverse. The contribution to this alternative would be small.

Conclusion. Impacts associated with boating and fishing would continue to have long-term, minor to moderate, adverse impacts in most of the park. In some areas where protective zoning would be in place around particularly sensitive resources, alternative 7 would result in long-term beneficial impacts on submerged aquatic communities. Cumulative impacts would be minor to moderate and adverse, although the actions proposed in alternative 7 would modestly reduce these adverse cumulative impacts of other past, present, and reasonably foreseeable actions.

Benefits would be less than a marine reserve zone due to the continued adverse ecological impact from allowing some fishing in the special recreation zone. Physical protection for this resource would be greater due to exclusion of traps within the larger special recreation zone.

Soundscapes

In the waters of the multiuse zone, impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include short-term, minor to moderate adverse impacts caused by boat noise on the water as well as short-term negligible adverse impacts caused by vehicles and routine maintenance equipment on land. In both cases, these noises can transcend the zone in which they originate and be heard in adjacent zones.

Natural soundscapes predominate in the distant portions of the park, away from popular boating routes. Increases in visitation on weekends and during special events add to the number of boats on the bay at one time. The expanded developed area according to city and county plans with its associated population increase is expected to continue and would be expected to result in increased boating and boat engine noise.

Impacts associated with an increased number of boats in the park would be short term, minor to moderate, and adverse.

Under alternative 7, there would be areas of the bay zoned for slow speed or noncombustion engine use. Because these limitations would reduce the level and duration of noise from boats, there would be long-term, beneficial impacts on soundscapes on portions of the bay and adjacent land.

There would be a limited amount of new construction in this alternative, occurring mostly in the visitor services / park administration zone. This would result in short-term, localized, adverse impacts that would be negligible to minor in intensity. Use of the new or upgraded facilities would result in a long-term, negligible adverse impact to natural soundscapes.

Existing natural soundscapes in the interior of the larger keys would continue to be preserved by protective zoning and relatively low visitor use—a continuing beneficial impact.

Cumulative Impacts. The expanded developed area according to city and county plans with its associated population increase is expected to continue and would be expected to result in increased boating and boat engine noise.

The beneficial and adverse impacts of this alternative, in combination with the adverse impacts of other actions, would result in minor and adverse cumulative impacts on the natural soundscape; however, the contribution of this alternative to these impacts would be a slight reduction of these adverse cumulative impacts.

Conclusion. Implementing alternative 7 would have long-term beneficial impacts on soundscapes due to protective zoning. Short-term negligible to minor, adverse impacts during construction and existing minor to moderate adverse impacts on natural soundscapes would continue as a result of persistent boat-related noise in much of the park. Existing negligible, short-term adverse impacts on natural soundscapes would continue as a result of routine park operations and maintenance activities.

CULTURAL RESOURCES

Archeological Resources (including submerged archeological)

Alternative 7 would have the same impacts as described in alternative 6, although potentially there would be slightly more benefits from alternative 7 due to a slight anticipated reduction in fishing-related impacts. Actions under alternatives 6 and 7, such as exclusion of visitors from West Arsenicker, Arsenicker, and Swan Keys, and prohibition of anchoring and fishing limitations in the special recreation zone would generally contribute to beneficial impacts on potential terrestrial archeological sites and both potential and known submerged archeological resources. Similar to alternative 6, adverse impacts from fishing gear would remain in alternative 7. The added protections in alternatives 6 and 7 would provide far less potential for treasure hunting, looting, amateur collection, and inadvertent visitor impacts.

Historic Structures and Buildings

Implementation of this alternative would generally have similar impacts on historic structures and buildings in Boca Chita Key Historic District and at Fowey Rocks Lighthouse as those listed under alternative 1 because the structures and buildings would be rehabilitated, preserved, and adaptively used in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. Some minor elements of historic fabric could be lost as a result of remodeling/rehabilitation efforts, and anticipated increasing visitation levels could result in loss of some historic fabric from inadvertent visitor use or vandalism. As with alternative 1, impacts on historic structures and buildings would be localized, long-term to permanent, generally beneficial, and of negligible to minor intensity.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. As described above, implementation of alternative 7 would result in negligible to minor adverse impacts and beneficial impacts. The impacts of alternative 7, in combination with negligible to minor adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long- and short-term beneficial impact. The adverse impacts of alternative 7, however, would be a small component of the adverse cumulative impact.

Conclusion. Implementation of this alternative would have similar impacts on historic structures and buildings in the Boca Chita Key Historic District as those listed under alternative 1 because they would be rehabilitated, preserved, and interpreted by the National Park Service in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. As with alternative 1, impacts on historic structures and buildings would be localized, long-term to permanent, and generally beneficial. Implementation of this alternative would have a long-term, beneficial impact on the Fowey Rocks Lighthouse because it would be preserved in accordance with the Secretary's Standards.

Actions under this alternative would generally have similar cumulative impacts on historic structures and buildings in the park as those listed under alternative 1. Implementation of this alternative would have cumulative beneficial impacts.

Section 106 Summary. The implementation of this alternative could include some minor adverse impacts on historic structures and buildings. If impacts remain minor there would be no adverse effects under section 106. Any adverse impacts resulting from moderate or major impacts would be mitigated through the use of *The Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation* and a memorandum of agreement with the state historic preservation office and the Advisory Council on Historic Preservation to counteract such adverse effects.

Cultural Landscapes

Same impacts as described in alternative 6, although potentially there would be slightly more benefits from alternative 7 due to an anticipated slight reduction in fishing-related impacts.

VISITOR EXPERIENCE

Diversity of Visitor Activities

Impacts not related to the special recreation zone are the same as alternative 6.

An area from Hawk Channel to the eastern park boundary (about 8% of park waters) would be placed in the special recreation zone with a summer seasonal recreational fishing closure and other limitations on fishing activities. Visitors to this zone would be able to engage in most of their current activities, and the future concessioner would continue to be able to take visitors here. For some visitors these fishing limitations would result in a minor adverse impact on their visitor experience. However, the reduced fishing pressure in this zone may result in more and bigger fish over time, which would result in a beneficial impact for both anglers and nonanglers.

Visitors who snorkel and scuba dive in the special recreation zone would be able to experience a healthier, more natural coral reef than what is currently present, with larger and more numerous tropical reef fish and an ecologically intact reef system. The increased number of mooring buoys would make the snorkeling and scuba diving experience safer and simpler. The prohibition on spearfishing also improves visitor safety. Therefore, a beneficial impact would be expected for

visitors who snorkel and scuba dive in the special recreation zone.

Anchoring would not be allowed in the special recreation zone and some visitors may feel this is an adverse impact on their visitor experience due to the lack of freedom to choose a stationary location. However, this should not be an adverse impact as additional mooring buoys would be provided to facilitate access to coral reefs and historic shipwrecks within this zone. The shift from anchoring to use of mooring buoys would improve resource conditions, which would improve visitor experience and create a safer environment for park visitors.

The seasonal closure and new regulations in the special recreation zone may also increase visitor confusion as well as law enforcement requirements. These concerns would result in short-term, negligible, adverse impacts to visitors initially following implementation of the new regulations.

Visitor Services and Facilities

The northern half of Boca Chita Key would be designated as a visitor services / park administration zone. Some of the historic structures could be used for expanded visitor services that might be provided through on-site staff or wayside exhibits. This would be a beneficial impact on enhancing visitor opportunities to learn about and experience the key.

In the harbor area at Elliott Key, accessibility for visitors would be enhanced through hardening the trail connecting the harbor with the ocean side. This would be a beneficial enhancement of visitor opportunities to better access the ocean side of Elliott Key.

The park would consider using Adams Key as a backup staging area for paddlecraft and might use Adams Key as a staging area for paddlecraft to access Porgy Key during special events or programs.

At Porgy Key, a dock for paddlecraft and interpretation of the old Jones homesite would provide long-term beneficial improvements in visitor opportunities to learn about and experience that key.

Cumulative Impacts. The expanded developed area according to city and county plans with its associated population increase that is expected to continue are being recognized by local, regional, state, and federal entities as major concerns affecting the region's environmental, economic, and community values. To this end, there are a number of recent and ongoing studies and partnership efforts underway in the Biscayne Bay area to improve and protect water quality and quantity, wetlands, fishery resources, and coastal viewsheds. Projects include the *Fishery Management Plan* for Biscayne National Park; the *South Miami-Dade Watershed Study and Plan*; the *Biscayne Bay Surface Water Improvement and Management Plan*; the *Lower East Coast Regional Water Supply Plan*; the Biscayne Bay Partnership Initiative; the Southeast Florida Coral Reef Initiative; and the *Biscayne Bay Coastal Wetlands Plan*.

The actions of this alternative, especially park zoning that could enhance resource conditions such as the slow speed, noncombustion engine use, sensitive resource, and nature observation zones, combined with these ongoing regional efforts, would have the potential to improve the quality of visitor activities in the region, especially related to fishing, nature viewing, and other resource-based recreational activities. There would also be improved visitor opportunities to learn from various sources regarding the importance and complexity of restoration efforts in a rapidly growing urban environment.

Adjacent state parks (such as Bill Baggs Cape Florida State Park, Key Largo Hammock Botanical State Park, and John Pennekamp Coral Reef State Park) and the Florida Keys National Marine Sanctuary offer services, facilities, and recreational opportunities that enable visitors to experience and learn about

the natural and cultural resources of the Biscayne Bay and Florida Keys region. Also, current efforts through the General Management Plan Amendment: Stiltsville Management Plan, and the Biscayne Bay Coastal Wetlands project provide potential opportunities for enhanced visitor access, education, and recreation related to the Biscayne Bay area.

The actions of this alternative to improve access and recreational opportunities and facilities would have the potential positive contribution of more and better public information about and access to the Biscayne Bay area and enhanced opportunities to learn about and recreate there, especially enhanced paddling opportunities.

The fishing restrictions in the special recreation zone, combined with similar prohibitions and/or restrictions in waters outside of the park boundary, could increase crowding in the few reef patches still open to fishing. This could be a long-term, moderate adverse impact to visitor experience of those fishermen.

Alternative 7 would have beneficial and adverse impacts, and when combined with the beneficial impacts of other actions, would result in beneficial cumulative impacts on visitor experience in the area. The contribution to the cumulative impacts of alternative 7 would be small.

Conclusion. Similar to alternative 6 except that the special recreation zone would have seasonal closures rather than fishing permit requirements. All fishers would have equal access to fish in the special recreation zone.

NPS OPERATIONS AND FACILITIES

Actions under alternative 7 would have similar impacts on park operations and facilities as those described for alternative 6.

Implementation of the adaptive management strategy for the special recreation zone would also require additional staff time for monitoring and enforcement of the seasonal fishing closure, although this would be less than required for implementation of alternative 6 because staff time would not be needed to administer the dual permit system, fulfill the monitoring requirements associated with the permits, or maintain collaborations with the FWC. Thus, implementation of this alternative is expected to result in long-term, negligible to minor, adverse impacts on park operations.

Cumulative Impacts. Similar to alternative 6 with less impacts to administrative and law enforcement operations due to lack of permit system.

Conclusion. Actions under alternative 7 would generally result in short-term, minor to moderate, adverse impacts on park operations during construction and implementation. There would also be long-term, minor adverse impacts that would be mitigated by increasing organizational capacity. Over time, the resolution of long-standing visitor use issues and conflicts would result in beneficial impacts to park operations. The overall cumulative impacts would be long term and beneficial for facilities and long term, negligible, and adverse for park operations. This alternative's contribution to these impacts would be small and beneficial for facilities and minor and adverse for park operations.

SOCIOECONOMIC ENVIRONMENT

Impacts not related to the special recreation zone are the same as alternative 6.

As in alternative 6, implementing alternative 7 would result in the creation of a special recreation zone, which is an area where some types of fishing would be prohibited. Unlike alternative 6, the number of fishing permits within this area would not be limited, but rather, the area would be closed to fishing during the summer months. This seasonal closure would have an adverse impact on

recreational fishing as this activity would have to occur elsewhere in or out of the park. The anticipated reduction in fishing pressure in this zone, where targeted fish species could grow larger and therefore increase in reproductive output, would be expected to result in a long-term, beneficial impact on recreational fishing and associated service-related sectors. It would have no impact on commercial lampara net fishing for ballyhoo because that harvest occurs during winter months and not during the closed season. The zone in this alternative would comprise about 8% of the park, so the impact would be expected to be long term, negligible and adverse.

Under this alternative, nonconsumptive recreation benefits, such as snorkeling and scuba diving, would be allowed. Economic studies have shown that snorkelers and scuba divers would increase trips with improvements in fish abundance, water visibility, and coral quality (Bhat 2003), all of which are expected to occur under this alternative, but to a lesser extent than alternatives 3, 4, and 5. Due to a shift in visitation patterns, the net effect in the number of visitors or average length of visit would be expected to be negligible. Therefore, under this alternative it is expected that there would be no impact on tourism-related businesses.

Impacts related to a conversion of a special recreation zone to a marine reserve zone are the same as alternative 6.

Similar to the no-action alternative, the continued presence of Biscayne National Park positively contributes to the value of surrounding private land.

Cumulative Impacts. Impacts associated with past and ongoing partnership and planning efforts, presence of nearby recreational opportunities and expanded developed area according to city and county plan with its associated population and park visitation increase would be similar to those described under alternative 1.

The proposed actions of this alternative to improve access and recreational opportunities and facilities, as well as the satellite visitor information sites, would support regional efforts in enhancing tourism and increasing visitor access and recreational opportunities in the area. The continuation of adverse impacts on submerged aquatic species, especially park coral reefs, has the potential to result in long-term, minor, adverse impacts on the economic benefits derived from these resources. This alternative, when combined with the impacts of other actions, would result in beneficial cumulative impacts on the regional socioeconomic environment.

The expected improvement in quality of visitor activities especially related to fishing, nature viewing, and other resource-based recreational activities resulting from zoning changes proposed in this alternative such as slow speed, noncombustion engine use, sensitive resource, and nature observation zones, combine with ongoing regional efforts, would have the potential to improve the regional socioeconomic environment—a long-term beneficial impact.

The long-term socioeconomic impacts of phasing out commercial fishing in the park are expected to be realized with implementation of the *Fishery Management Plan* (2014) and are assessed in that plan. For more information on the *Fishery Management Plan*, please visit http://www.nps.gov/bisc /parkmgmt/fishery-management-plan.htm.

Alternative 7 would contribute a small increment to the above impacts of other past, present, and future actions on socioeconomic conditions and, when considered in combination with other actions, would result in a beneficial cumulative impact.

Conclusion. The strong protection of natural and cultural resources that is expected to enhance resource conditions would have a long-term beneficial impact to the regional socioeconomic environment. Upgrades in park visitor services and facilities would support regional efforts to enhance tourism

and increase visitor access and recreational opportunities in the area. The conversion of the special recreation zone to a marine reserve zone would result in long-term, negligible, adverse impacts to commercial fishing as fishing would have to occur elsewhere in or out of the park. There would be long-term beneficial impacts would occur to for snorkeling- and scuba diving-related businesses from the continuation of nonconsumptive recreation uses in the special recreation area. The expected spillover effect, where targeted fish species could grow larger and therefore increase in reproductive output, would generally contribute to long-term, beneficial impacts on recreational fishing and associated service-related sectors. The overall cumulative impacts would be beneficial with this alternative contributing a small increment.

UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts are defined here as impacts that cannot be fully mitigated or avoided.

Existing moderate or major adverse impacts to fishery resources, federally listed sea turtles, smalltooth sawfish, stony corals, submerged aquatic communities, and natural soundscapes would be expected to continue in the majority of park waters included in the multiuse zone. These impacts are primarily caused by the relatively unrestricted use of motorized boats as well as fishing and marine debris that continue to impact most park waters and submerged habitats.

New actions proposed under this alternative would reduce some or all of those impacts to many of the most sensitive areas of park waters. Thus there would be no new unavoidable moderate or major adverse impacts expected as a result of implementing alternative 7.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Alternative 7 would have a small potential for some commitments of resources because it would involve a minimum of new development (e.g., trails, primitive dock, marine signage). However, most of the development being proposed is minimal, such as trails with only small areas of potential impact. Most proposed development would be built in previously disturbed areas, so would not result in irreversible or irretrievable commitments of resources. Cultural resources would continue to be protected through active preservation maintenance.

NATURAL OR DEPLETABLE RESOURCES AND ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

Whenever feasible, the National Park Service strives to maximize the use of renewable resources and energy and therefore minimize the use of depletable resources. However, it is not possible with today's technologies to cost-effectively avoid all use of depletable resources in building and operating facilities.

Implementing alternative 7 would involve minimal increase in energy requirements.

IMPACTS OF IMPLEMENTING ALTERNATIVE 8: FINAL NPS PREFERRED ALTERNATIVE

NATURAL RESOURCES

Fishery Resources

In the waters of the multiuse zone (water) impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include impacts on fishery resources and fish habitat caused by boating and fishing in the park. These impacts would continue to be long term, minor to moderate, and adverse.

Proposed management actions under alternative 8 include designating the West, Middle, and East Featherbed Banks as noncombustion engine use zones and expanding this zone in the Jones Lagoon area. This zone would limit the speed and type of boats entering these waters, thus reducing boat traffic overall as well as reducing the impacts associated with boat traffic such as scarring of seagrass beds and localized turbidity. This would be a long-term beneficial impact.

There would be a 1,000-feet-wide slow speed zone adjacent to the park-owned mainland shoreline from the northern boundary to the north end of Midnight Pass near the southern boundary. Also included in the slow speed zone would be the area along Caesar Creek, south of Adams Key to Porgy Key, including the navigational channel between markers 20 to 24. The slow speed zone would reduce the potential for scarring in the seagrass beds in this area as well as reduce the potential for turbidity in the water column, thus minimizing adverse impacts on the productivity of this habitat and water quality in the area. Thus, the slow speed zone would have a beneficial impact on the quality of fish habitat in this area. There would be an idle speed zone along the west coast of Elliott Key from the southwest tip of Sands Key extending south to Elliott Key Harbor. The idle speed would have beneficial impact on the quality of fish habitat in this area as well.

A marine reserve zone where fishing is not allowed would be managed to preserve and improve natural resources. The designation of a marine reserve zone would prohibit commercial and recreational fishing in about 10,502 acres, or about 6% of total park area. About 37% of the park's hardbottom habitat would be within this zone, and 63% of the park's hardbottom habitat would be available for fishing outside the area protected by the marine reserve zone. This locally reduced fishing pressure where targeted fish species could grow larger and therefore exponentially increase in reproductive output would result in a long-term, beneficial impact on park fishery resources.

Even though fishing pressure may increase outside this zone, the anticipated increase in size and abundance of fish within the marine reserve zone is expected to have a spillover effect outside the zone, as documented in other marine reserve zones worldwide. Research has shown that marine reserves deliver a wide range of benefits to conservation, science, and general management. Marine reserves allow not only for the recovery of fish species/stocks, they provide sufficient protection for the ecosystems they encompass (Bohnsack 1994).

Species in both the bay and the reefs outside the marine reserve zone would continue to experience substantial pressures from both commercial and recreational fishing, although if the *Fishery Management Plan* is fully implemented, commercial fishing would be phased out over time. Some fish species would continue to be overfished or subject to overfishing. These impacts would continue to

be adverse and minor to moderate in the long term.

There could be an increase in the number of people fishing from the shoreline if a new boardwalk was built facing the bay waters. This would be expected to have a long-term, negligible, adverse impact on park fishery resources.

Alternative 8 would provide a greater benefit to fishery resource habitat in the seagrass beds than alternative 1 because a larger area for seagrass beds in the park would be included in protective zoning designation.

These zones include the noncombustion engine use zone, the idled speed zone, the slow speed zone, and the marine reserve zone, all of which contain seagrass beds.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to alternative 1. The reduction of adverse impacts from human activities on coral reefs and associated ecosystems, combined with efforts from the United States Coral Reef Task Force and the *Fishery Management Plan*, would generally result in beneficial impacts. The intensity and duration of the cumulative impact of the above planning efforts would depend on the number and type of actions taken to implement these plans.

The fishing prohibition in the marine reserve zone, combined with similar prohibitions and/or restrictions in waters outside park boundaries could increase fishing pressure and related impacts of overfishing and marine debris in the 78% of park reef area still open to fishing. This could be a long-term, moderate adverse impact to those overfished reefs, but the overall impact to fish populations and fish habitat would be mitigated by the protection of prime reefs that serve as nursery grounds to maintain populations of fish species as well as by the anticipated spillover effect of fish populations from the marine reserve.

This alternative would contribute to the beneficial impacts of other past, present, and future actions resulting in beneficial cumulative impacts.

Conclusion. Long-term, minor to moderate, adverse impacts now occurring on park fishery resources and fish habitat in the park would persist in most of the park waters. Such impacts would be dramatically reduced in areas of protective zoning, particularly in the marine reserve zone, resulting in a long-term, beneficial impact to fish and fish habitat in some locations. There would be no new adverse impacts from proposed management actions.

Threatened and Endangered Species

Manatee. Manatees are more likely to be found in the warm waters nearest the shore, so the 1,000-foot-wide slow speed zone adjacent to the entire length of the mainland shoreline would provide protection for manatees in this area. The slow speed zone would provide boat operators a greater opportunity to avoid collisions with manatees by increasing manatees' time to respond. Extending the slow speed zone along the entire park mainland shoreline under this alternative would also result in fewer boat groundings in seagrass beds, an important habitat/food source for manatees.

The modifications to the manatee protection area and zoning would have a long-term beneficial impact on manatees and manatee habitat in the park.

Section 7 Determination of Effect— Measurable beneficial outcomes on individual manatees and the manatee population because of the protective zones are likely. The determination of effect is "may affect, not likely to adversely affect" for manatees under alternative 8.

Sea Turtles. In the waters of the multiuse zone (water), impacts described in the no-action alternative (alternative 1) would

probably persist. These impacts include potential for collisions with boats, strangulation and entanglement with marine debris (including lobster and crab traps), hook-and-line fishing, and vessel groundings on sea turtle foraging habitat (coral and seagrass), which may adversely affect sea turtles, particularly loggerhead, hawksbill, and green species. Leatherback and Kemp's Ridley would be less likely to be affected because they are rarely in the park. These impacts would continue to be long term, minor to moderate, and adverse.

Collisions between boats and sea turtles would be expected to be minimized in the slow speed and the noncombustion engine use zones.

The implementation of a marine reserve zone would result in less derelict fishing gear and commercial lobster trap gear (e.g., monofilament line and traps) in this area, which is known to cause strangulation, entrapment, and fatalities to sea turtles. This would result in the reduction of these threats to sea turtles within this zone and would be a long-term, beneficial impact on sea turtles. This beneficial impact would be offset if fishing pressure increased outside the marine reserve zone.

Studies in Florida and other areas in the world have shown that artificial light adversely impacts sea turtle nesting. Light on Elliott Key is primarily generated from park facilities, campground, and visitor harbor, all on the bay side of the island. This artificial light does not reach the nesting beaches, which are on the ocean side of the island. Any light generated by campers in the group campsite, located on the ocean side of Elliott Key, would be minimal and unlikely to reach sea turtle nesting beaches. The proposed development in this alternative would not increase artificial light on the island. There would not be a substantial amount of light from the campsites. Mitigation measures such as education efforts regarding the importance of reducing artificial light, additional monitoring and patrols as visitation increases, and possibly limitations on the number of visitors would reduce the level of adverse impacts. The improvement of the existing trail on Elliott Key could increase the number of visitors that venture to the beaches where the turtles tend to nest. This could require that the park change the management of this area to minimize disturbance to the turtles. Additional mitigation measures could also include increased visitor education and increased monitoring throughout the park and particularly in areas near turtle nesting areas. With mitigation, the impacts would be long term and adverse but negligible.

Section 7 Determination of Effect— Impacts to sea turtles from fishing and boating would persist in most of the park, resulting in a determination of "may affect, likely to adversely affect" for loggerhead, hawksbill, and green sea turtle species that frequent park waters.

American Crocodile. Most visitor services and infrastructure in habitat suitable for crocodiles would remain near current levels with the designated paths, with the exception of a possible viewing platform and boardwalk in the vicinity of Convoy Point. This area is north of the designated critical habitat area for the crocodiles and so would not be expected to impact their activities in the park. The mangroves south of the visitor center would continue to be managed primarily to protect the natural habitat characteristics of the area. No additional development within the designated critical habitat area would be proposed under alternative 8. The impacts of activities on crocodile habitat and activities along the mainland shore would be long term, negligible and adverse.

Under this alternative, a canoe and kayak ramp would be built on Porgy Key, but this would only slightly increase the development footprint on this island. The noncombustion engine use zone would include the eastern shoreline of Old Rhodes Key and the waters around Totten Key so relatively few visitors would be expected in this area because of

boating limitations. Although in designated critical habitat, there are relatively few crocodiles documented in this area of the park.

If population of crocodiles were to increase within the park, there could be increased interaction between visitors and crocodiles. The developed area at Adams Key provides an excellent opportunity to orient visitors to designated critical habitat for crocodiles, including appropriate actions when traveling in crocodile habitat. With mitigation, the long-term adverse impact of this alternative on the crocodile population in this area of the park would be negligible.

As a whole, the park protects habitat for the crocodile and serves to further its conservation through education and law enforcement, resulting in long-term beneficial impacts to this species.

Section 7 Determination of Effect— The long-term impacts on the American crocodile under alternative 8 would be both beneficial due to habitat protection and education as well as negligible and adverse in localized areas. Mitigation measures would be put in place in the event of more human-crocodile interactions. Overall, this would equate to a "may affect, not likely to adversely affect" determination for the American crocodile.

Smalltooth Sawfish. In the waters of the multiuse zone (water), impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include potential for bycatch, which could occur with any continuation of hook-and-line fishing efforts as well as potential for entanglement in marine debris such as fishing line and nets. Construction of a boardwalk and platform to interpret the mangroves in the Convoy Point area would affect a small amount of potential shallow water habitat. These impacts would continue to be long term, minor to moderate, and adverse, although realizing such effects is unlikely given the rarity of smalltooth sawfish in the park.

While the establishment of the marine reserve zone in deeper reef habitat is not likely to have a substantial effect on this species, which tends to prefer shallow water, it is possible that implementation of the no-take marine reserve zone could have a small yet positive benefit on smalltooth sawfish by reducing bycatch since reports of this species in reef and deeper water habitats, although uncommon, do exist. This locally reduced fishing pressure, where targeted fish species could grow larger and therefore increase in reproductive output, would result in a long-term beneficial impact on park fishery resources and effectively eliminate impacts to smalltooth sawfish from bycatch or entanglement in marine debris. Increased public outreach and/or law enforcement efforts would probably reduce the potential for illegal harvest of fish, including smalltooth sawfish. No other actions that would occur under alternative 8 would be expected to affect sawfish in the park.

Section 7 Determination of Effect— Existing impacts from fishing would persist in much of the park and may be locally reduced in some shallow water locations zoned for sensitive resources, noncombustion engine use, and slow speed. The section 7 effect determination would be "may affect, likely to adversely affect" for smalltooth sawfish under alternative 8.

Schaus Swallowtail Butterfly and Miami Blue Butterfly. New development on Adams Key where butterfly habitat exists would be limited in scale to include only the staging area for paddlecraft and possibly minimal facilities for the environmental education center. The level of development on the island would occur near the shore where habitat is less suitable for butterflies and would be unlikely to impact the butterfly population or habitat on the island. However, there is typically little interaction between visitors and these butterflies. The impacts would be long term, negligible, and adverse.

On Elliott Key, the existing Breezeway Loop Trail and boardwalk would be made

accessible but this change would probably not alter its footprint or measurably increase visitor use. During improvement activities, the area would be checked by a qualified biologist to ensure that no individuals or preferred host or nectar plants would be disturbed. Under this alternative and with any necessary mitigation, including scheduling construction activities outside butterfly flight season, the impact on the butterflies and their habitats in the park would be long term, negligible, and adverse.

Old Rhodes and the other southern keys would be zoned for nature observation. Swan Key, Mangrove Key, and Soldier Key would be zoned as a sensitive resource area. Impacts on the hardwood hammocks on these keys would not change under alternative 8. There would be no impacts on butterfly populations and habitat caused by this alternative. The greatest threat to the butterflies and their habitat within the park would remain weather-related phenomena and exotic invasive species.

Continued protection of butterfly habitat on these keys would generally be a long-term, beneficial impact on these butterfly species.

Section 7 Determination of Effect— The impacts on the Schaus swallowtail butterfly and the Miami blue butterfly would be both beneficial and long term, negligible and adverse in some locations, but mitigation measures to protect the species' habitat and breeding season are likely to be successful. Overall, the determination of effect for alternative 8 is "may affect, not likely to adversely affect" the Schaus swallowtail butterfly and the Miami blue butterfly.

Stony Corals. In the waters of the multiuse zone (water) impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include the potential for ecological and physical stress to corals from overfishing, fishing debris, anchoring, and/or vessel groundings associated with existing boating and fishing activities. Such impacts are moderate, long term adverse to stony corals and their habitat.

Legare Anchorage would be reduced in size, and in-water activities would continue to be restricted and therefore continue to provide protection to corals in this area.

The creation of a 10,502-acre marine reserve zone would prohibit commercial and recreational fishing and phase-out anchoring on approximately 30% of the southern reefs within the park, which include areas known to have healthy populations of stony corals. Because visitors who would otherwise use the area in the marine reserve zone to fish would have to fish elsewhere, boat traffic and anchoring throughout this zone could be expected to decrease. Some of this decrease would be offset by an anticipated increased use of the zone by snorkelers and scuba divers. Because the marine reserve zone is expected to reduce fishing, improve ecological balance, reduce fishing debris, reduce vessel groundings, and reduce damage from anchoring in stony coral habitat, actions under alternative 8 are expected to have a long-term, beneficial impact. While the nonextractive in-water activities of snorkelers and scuba divers would pose an increased risk of abrasion of corals and/or sedimentation from accidental touching, kicking, and stepping, these impacts could be mitigated by education and would be on a much smaller scale than the impacts of discarded and improperly used fishing gear currently occurring in the zone, and by the beneficial impacts of implementation of the marine reserve zone.

It is anticipated that commercial fishing would be phased out parkwide as provided for in the *Fishery Management Plan* (2014); however, implementation of a marine reserve zone would prohibit commercial and recreational fishing in this zone, including the ballyhoo lampara net fishery, after passage of a park special regulation. This locally reduced fishing pressure, where targeted fish species could grow larger and therefore increase in

reproductive output, would result in a long-term beneficial impact on stony coral habitat.

The addition or relocation of mooring buoys and boundary markers would result in short-term, negligible to minor adverse impacts in specific areas associated with underwater installation and associated impacts to submerged substrates, although every effort would be made to install in locations away from corals, seagrass beds, and submerged archeological sites. Increased public outreach and/or law enforcement efforts would probably reduce the potential for anchoring that could impact stony corals.

The use and maintenance of navigational markers and mooring buoys would continue to minimize impacts to stony corals from unintentional vessel and anchor damage. Anchoring will be phased out as mooring buoys are added.

Section 7 Determination of Effect— Existing boating, fishing, and marine debris impacts would persist in much of park waters and continue to impact stony corals and their habitat. The marine reserve zone is expected to have long-term, beneficial effects on stony corals within that area by protecting them from activities that could lead to physical and ecological damage, thus reducing but not eliminating the adverse effects parkwide. Thus, this alternative would result in a determination of "may affect, likely to adversely affect" on stony corals.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar as those described under alternative 1. Alternative 8 would result in negligible adverse and beneficial impacts on federally listed species. When combined with the impacts of other past, present, and future actions, the overall cumulative effect would be beneficial. This alternative would contribute a slight amount to the overall cumulative effects.

Conclusion. Existing impacts to listed species and their habitat would persist in much of the park. Some impacts would be reduced through changes in zoning, which would be expected to have localized beneficial impacts, most notably on the stony corals and other marine species in the marine reserve zone. In addition, this alternative would have a long-term beneficial impact on manatees due to slow speed and noncombustion engine use zones. Taking action on this alternative to protect reefs from other pressures, such as overfishing and physical damage from fishing gear, anchoring, and vessel groundings, might also increase reef resiliency, potentially delaying the effects of global-scale stressors such as climate change, ocean acidification, and land-based sources of pollution (Jackson 2014). This is expected to result in beneficial impacts for stony corals and the listed species that depend on reef habitats such as sea turtles.

Under this alternative, there would be proposed small-scale development (a canoe and kayak dock at Porgy Key and hardening trails on Elliott Key) that could have long-term, negligible adverse impacts on habitats used by American crocodiles, sea turtles, and butterflies. The park would continue to coordinate with the U.S. Fish and Wildlife Service and NOAA Fisheries and work to avoid and mitigate any adverse impacts on these species. Thus, the section 7 determination would be "may affect, not likely to adversely affect for those species."

Existing impacts to sea turtles, stony corals, and smalltooth sawfish would continue to be long term, moderate and adverse and would result in a "may affect, likely to adversely affect" determination although there are no new impacts to these species associated with any proposed actions.

Cumulative effects would be negligible to beneficial. This alternative would contribute a small amount to the overall cumulative effects.

Special Status Species, Including State Listed Bird Species

Arsenicker Key, West Arsenicker Key, and Mangrove Key host wading bird colonies including state listed wading birds and state listed white-crowned pigeons; West Arsenicker also hosts nesting bald eagles. These keys would be zoned a sensitive resource zone and would remain closed to visitors. Thus, there would be no effect on the West Arsenicker Key bald eagle population or state listed wading birds or white-crowned pigeons or nesting activity for these species in any of these keys under this alternative. Furthermore, extending the sensitive resource zone 300 feet into the water from the sensitive resource zones around West Arsenicker Key, Arsenicker Key, and Mangrove Key would further reduce the likelihood of disturbances to bald eagles, State listed wading birds, white-crowned pigeons, or any other state listed birds using these islands. There is currently a bald eagle nest on the mainland shoreline south of Black Point. The establishment of a slow speed, minimal wake zone extending 300 feet off the mainland shoreline into the bay waters is expected to provide a level of protection to this area that already has low visitation.

Under this alternative, the islands surrounding Jones Lagoon would be zoned nature observation zones and visitation would be allowed. Most of the waters of Jones Lagoon would be designated a noncombustion engine use zone. The small islands within Jones Lagoon, as well as a 300-foot buffer extending into the waters around them would be designated a sensitive resource zone to protect waterbird colonies that include state listed wading bird species. Visitation would be allowed on the other islands of Jones Lagoon, so there would be some human-caused intrusions to birds roosting, loafing, and/or foraging there; however, resource protection would be emphasized and human entry to the colonies themselves would be prohibited. Soldier Key and a 300-foot buffer extending into the waters around it would also be designated a sensitive resource zone to protect waterbird colonies including state listed wading birds. Actions under alternative 8 would reduce, although not eliminate, the potential for disturbance to birds using Soldier Key and the Jones Lagoon area because there is still the possibility that small vessels (e.g., paddlecraft) in Jones Lagoon and motor vessels by Soldier Key would approach birds due to low NPS presence within these areas.

The establishment of a visitor services zone on Porgy Key could encourage visitation to the Jones Lagoon area, although the difficulty in accessing this area and the specialized equipment and knowledge needed to safely traverse Jones Lagoon would keep the likelihood of this fairly low. Given that visitation to Jones Lagoon would be expected to remain minimal, adverse impacts on the birds and their habitat would be negligible. If visitation increases such that any state listed birds could be disturbed, management actions could include further limiting access to areas where birds are known to nest because human disturbance has the potential for nesting birds to inadvertently crush their eggs while fleeing or to temporarily or permanently abandon their nests, thereby exposing the eggs to predators and extreme temperatures. Under this alternative, the long-term adverse impact on state listed bird populations in the park and potential nesting activity in other parts of the Jones Lagoon area would be negligible. The protective measures to reduce human disturbance on all wading bird colonies are expected to have a beneficial impact for state listed birds.

Currently, visitation to the ocean side of Elliott Key is low.

The proposed idle speed zone on the bay side of Elliott Key would be expected to reduce the likelihood of disruption of birds using the coastal areas immediately adjacent to this zone. As a result, beneficial impacts on state listed birds in the immediate area would be expected.

Under this alternative, birds using coastal habitats along the park's mainland shoreline would receive protection from potential boat-related disturbances from a slow speed zone covering the area 1,000 feet from the mainland shoreline. By reducing the speed of boats in the waters immediately adjacent to the mainland shoreline, potential boat-related disturbances are expected to be reduced for birds that are roosting, nesting, foraging, and/or loafing along the mainland shoreline. Some birds may still experience disturbance from noise associated with motorized watercraft in this zone, even though boats would be operating at slower speeds.

Overall, this alternative, including any necessary mitigation, would probably result in long-term, negligible adverse impacts due to the proposed development in this alternative. There would be beneficial impacts on state listed bird populations and nesting activity in the park due to the establishment of protective zones around the above-mentioned keys.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. Alternative 8 would result in negligible impacts on listed birds due to increased visitor use and construction of minor visitor facilities. When combined with the impacts of other past, present, and future actions, the overall cumulative effect would be minor and adverse. This alternative would have a small contribution to overall cumulative effects.

Conclusion. Implementing alternative 8 would result in long-term, negligible adverse impacts on state listed birds due to proposed development; however, it is unlikely to lead to federal listing. There would be beneficial impacts to state listed birds through protective zoning, which would reduce the likelihood of disturbance in important bird habitats caused by visitor activities. Cumulative effects would be minor and adverse.

Terrestrial Vegetation

Under alternative 8, the impacts on terrestrial vegetation on the keys, particularly the hardwood hammocks, would be less than for alternatives 2 and 3. Although Boca Chita, Elliott, Adams, and Porgy Keys would still include areas managed for visitor access and recreation, these areas would be smaller than under alternatives 2 and 3.

Access to the Jones homesite on Porgy Key would be managed to minimize impacts on sensitive resources. Visitation to the keys would still be expected to increase over current levels because visitor services would be concentrated in these areas. The adverse impacts from increased visitation could include trampling and loss of vegetation from social trails. In general, these impacts could be mitigated by visitor education efforts and trail design to keep visitors on the existing trails. With mitigation measures in place, the impacts would be long term, negligible to minor and adverse.

Under this alternative, the existing Breezeway Loop Trail and boardwalk are hardened to provide universal access. With mitigation, the localized impacts on vegetation would be long term, negligible and adverse.

Long-term impacts from the proposed Convoy Point boardwalk would include the removal of mangroves and other wetland plants, trimming mangroves, and would have shading impacts on mangroves and other vegetation. Localized impacts would be long term, minor, and adverse.

Under this alternative, much of the mainland shoreline, Sands Key, and the islands surrounding Jones Lagoon would be zoned as nature observation zones and visitation would be allowed, however protection would be emphasized. This expected to have a long-term beneficial impact on terrestrial vegetation on these islands.

Cumulative Impacts. Impacts associated with other past, present, and reasonably

foreseeable actions would be similar as those described under alternative 1. When the negligible to minor adverse impacts of alternative 8 are combined with the beneficial impacts of other past, present, and future actions, the resulting cumulative impacts would continue to be beneficial. This alternative would slightly reduce these beneficial cumulative impacts.

Conclusion. Implementing this alternative would result in long-term, negligible to minor adverse impacts on terrestrial vegetation in localized areas associated with minor construction projects and continued or increasing visitor use. Cumulative impacts would be beneficial. This alternative would slightly reduce these beneficial cumulative impacts. Adverse impacts would be less than alternative 2 due to the smaller footprint of trail improvements on Elliott Key.

Wetlands

Wetlands, indicated by mangroves, are located along the mainland coast and the fringes of the keys in the park. Wetlands in the park would continue to serve as an important habitat area for a wide variety of terrestrial and aquatic species. Placement of the nature observation zone and the slow speed zone in the open water along the mainland shoreline along portions of the mainland would give greater protection to mangrove shorelines. The idle speed zone on the bay side of Elliott Key would also protect the mangrove shorelines. This would have long-term, beneficial impacts.

Under this alternative, construction of a boardwalk or viewing platform would be considered to interpret the mangrove forests and the mangrove shoreline north of the visitor center at Convoy Point. The visitor center boardwalk and jetty could be upgraded. With these improvements, visitors would have an opportunity to experience the mangroves along the shore north of Dante Fascell Visitor Center at Convoy Point. Construction of the boardwalk and viewing platform would cause both short-term and long-term adverse impacts on the mangroves along the mainland shoreline of the park. During construction, there would be short-term adverse impacts on water quality from increased turbidity. Increased turbidity in the water column could degrade the habitat for wetland plant species. These localized impacts would be short term, minor to moderate, and adverse.

Long-term impacts from the proposed boardwalk might include removal of some mangroves and other wetland plants, trimming mangroves, and shading mangroves and other aquatic life. Impacts would be long term, minor, and adverse. These impacts could be mitigated during the design process to ensure that structures do not substantially shade the mangroves. With mitigation the adverse impacts would be long term but minor.

No additional access into the mangroves that fringe the keys would be developed under this alternative so there would be no change in the current size, integrity, or continuity of these other wetland areas in the park. Mangroves are extremely difficult to walk through, and while the proposed visitor facility improvements at Porgy, Elliott, and Boca Chita Keys might attract more visitors—this is not likely to affect the wetlands.

Cumulative Impacts. The actions proposed in the Biscayne Bay Coastal Wetlands Project could improve the overall health of wetland areas along the mainland shoreline such that the system as a whole is better able to accommodate the stresses associated with the short- and long-term impacts of development and human use in the area.

Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. This alternative would contribute minor adverse impacts to the beneficial impacts of other present and future actions resulting in a beneficial cumulative impact. This alternative

would slightly reduce these beneficial cumulative impacts in localized areas.

Conclusion. Localized impacts associated with construction under alternative 8 would be short term, minor to moderate and adverse. The long-term impacts of the new facilities would be mitigated through design and would be adverse and minor. Cumulative impacts would be beneficial. This alternative would slightly reduce these beneficial cumulative impacts.

Submerged Aquatic Communities

In the waters of the multiuse zone, impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include impacts on submerged aquatic communities caused by boating and fishing and associated marine debris. These impacts would continue to be long term, minor to moderate, and adverse.

Under this alternative, there would be greater controls on speed and vessel types in areas containing submerged aquatic communities, particularly seagrass beds. The West, Middle, and East Featherbed Banks, as well as the waters around Jones Lagoon, would be zoned for noncombustion engine use. Boats in this zone would be traveling relatively slowly, and fewer boats would be operating with high-speed propellers so the potential for scarring seagrass beds and hardbottom communities would be substantially reduced. Within the noncombustion engine use zone, the potential for turbidity in the water column caused by motorboats would also be reduced. Thus, the health of the seagrass beds would be improved under this alternative—a long-term beneficial impact.

A strip along the mainland shore from 1,000 feet out would be designated as a slow speed zone to protect natural marine resources such as seagrass. In addition, the idle speed zone on the bay side of Elliott Key from Sands Cut to Elliott Key Harbor would also protect sea grasses. Because the boats in these areas would be traveling at a reduced rate of speed, there would be reduced potential for seagrass scarring. The proposed marine reserve zone is also expected to protect seagrass beds within zone boundaries, from the addition of mooring buoys and a phase out of anchoring within the area.

The proposed Convoy Point boardwalk could result in removal of wetland plants and have shading impacts on seagrasses and other aquatic life. Impacts would be adverse, minor, and long term. The boardwalk would be designed to avoid and minimize these impacts to the extent possible.

Under this alternative, a marine reserve zone would be designated from Hawk Channel east to the park boundary. The marine reserve zone would be managed to preserve natural resources with minimal human-caused intrusions with the goal of providing a healthy coral reef ecosystem for a more enjoyable and diverse visitor experience. Boat size, type, and speed could be regulated to protect resources in this zone. It would be expected that adverse impacts on the reef from boating and fishing activities would be significantly reduced under this alternative. In particular, the potential for scarring, coral breakage or damage, from boat propellers, vessel groundings and anchor damage would be greatly reduced, but there could still be adverse impacts from other currently existing recreational activities such as scuba diving (Barker and Roberts 2004; Hall 2001; Medio et al. 1997). These adverse impacts of scuba diving on the structure and function of the coral reef as habitat would be the same as for alternative 3. Implementation of the reserve zone would generally reduce the impacts of fishing activities in this area of the reef and could potentially increase the resiliency of the reefs within this zone to external pressures such as marine debris, pollution, climate change, ocean acidification and coral bleaching (Mumby et al. 2013) resulting in a long-term beneficial impact. Impacts from fishing and anchoring would continue outside the marine reserve zone.

It is anticipated that commercial fishing would be phased out parkwide as provided for in the *Fishery Management Plan* (2014); however, implementation of a marine reserve zone would prohibit commercial and recreational fishing in this zone, including the ballyhoo lampara net fishery, after passage of a park special regulation. This locally reduced fishing pressure, where targeted fish species could grow larger and therefore increase in reproductive output, would result in a long-term beneficial impact on submerged aquatic habitats.

The addition or relocation of mooring buoys and boundary markers would result in short-term, minor adverse impacts in specific areas associated with underwater installation and associated impacts to submerged substrates, although mooring buoys and boundary markers would be placed away from corals, seagrass beds, and submerged cultural resources. Increased public outreach and/or law enforcement efforts would probably reduce the potential for illegal anchoring that could impact submerged aquatic communities and thus is a beneficial impact.

Overall, the health of the seagrass beds would be expected to increase under this alternative because of the increased areas zoned for idle speed and slow speed and noncombustion engines and the addition of a marine reserve zone. The increased health of seagrass beds would have a long-term beneficial impact.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. Alternative 8 would result in long-term beneficial impacts. When combined with the adverse impacts of other past, present, and future actions, the cumulative impacts would be minor to moderate and adverse. The contribution of this alternative to these cumulative impacts would be small.

Conclusion. Impacts associated with boating and fishing would continue to have long-term, minor to moderate, adverse impacts in most of the park. However, in areas zoned for resource protection, including the marine reserve zone, there would be long-term beneficial impacts on submerged aquatic communities. Cumulative impacts would be minor to moderate and adverse, although the actions proposed in alternative 8 would reduce these adverse cumulative impacts of other past, present, and reasonably foreseeable actions.

Soundscapes

In the waters of the multiuse zone, impacts described in the no-action alternative (alternative 1) would probably persist. These impacts include short-term, minor to moderate adverse impacts caused by boat noise as well as short-term negligible adverse impacts caused by vehicles and routine maintenance equipment on land. In both cases, these noises can transcend the zone in which they originate and be heard in adjacent zones.

Natural soundscapes predominate in the distant portions of the park, away from popular boating routes. Increases in visitation on weekends and during special events add to the number of boats on the bay at one time. The expanded developed area according to city and county plans with its associated population increase is expected to continue and would be expected to result in increased boating and boat engine noise. Impacts associated with an increased number of boats in the park would be short term, minor to moderate, and adverse.

Under alternative 8, there would be areas of the bay zoned for idle, slow speed, or noncombustion engine use. Because these limitations would reduce the level and duration of noise from boats, there would be long-term, beneficial impacts on soundscapes on portions of the bay and adjacent land.

There would be a limited amount of new construction in this alternative occurring mostly in the visitor services and park

administration zone. Localized impacts associated with construction under this alternative would be short term, negligible to minor and adverse. Use of the new or upgraded facilities would result in a long-term, negligible, adverse impact to natural soundscapes.

Existing natural soundscapes in the interior of the larger keys would continue to be preserved by protective zoning, vegetation screening, and relatively low visitor use—a continuing beneficial impact.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be the similar as those described under alternative 1. The beneficial and adverse impacts of this alternative, in combination with the adverse impacts of other actions, would result in minor and adverse cumulative impacts on the natural soundscape; however, the contribution of this alternative to these impacts would be a slight reduction of these adverse cumulative impacts.

Conclusion. Implementing alternative 8 would have long-term beneficial impacts on soundscapes due to protective zoning. Short-term, negligible to minor, adverse impacts during construction and existing minor to moderate adverse impacts on natural soundscapes would continue as a result of persistent boat-related noise in much of the park. Existing negligible, short-term adverse impacts on natural soundscapes would continue as a result of routine park operations and maintenance activities.

CULTURAL RESOURCES

Archeological Resources (including submerged archeological)

Implementation of this alternative would have similar impacts on archeological resources as those listed in alternative 1. The strong emphasis on cultural resource protection could be expected to have some additional beneficial impacts on archeological resources (including submerged archeological) sites. The exclusion of visitors from West Arsenicker, Arsenicker, Soldier, and Swan Keys would generally contribute to beneficial impacts on potential and known terrestrial archeological sites.

Under this alternative, a marine reserve zone would be designated from Hawk Channel east to the park boundary. The marine reserve zone would prohibit recreational and commercial fishing and phase out anchoring on many of the southern reefs in the park, which includes potential maritime and cultural landscape areas. This prohibition of fishing would virtually eliminate the on-site generation of fishing-related marine debris and its associated impacts on submerged cultural resources, which would be a long-term beneficial impact. The potentially increased scuba diving-related activities associated with a healthy and attractive coral reef system could have negligible to minor adverse impacts on submerged cultural resources due to depreciative visitor behaviors and accidental damage. Impacts from fishing and anchoring would continue outside the marine reserve zone.

The addition or relocation of mooring buoys and boundary markers would result in long-term beneficial impacts to submerged cultural resources, as they would provide protection to sites from the threat of anchor damage. With increased public outreach and/or law enforcement efforts reducing the potential for illegal anchoring, these long-term benefits would be enhanced. The installation of mooring buoys in conjunction with no anchoring zones would also result in long-term beneficial impacts to submerged cultural resources sensitive to visitation pressure, by providing a means of controlling visitor carrying capacity at the sites.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those

described under alternative 1. As described above, implementation of alternative 8 would result in short-term, minor adverse impacts and long-term, beneficial impacts. The impacts of alternative 8, in combination with negligible to minor adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a negligible to minor adverse cumulative impact. The adverse impacts of alternative 8, however, would be a small component of the adverse cumulative impact.

Conclusion. Implementation of this alternative would have beneficial impacts on archeological resources because of the potential for reduced anchor damage and decreased visitation pressures on some submerged archeological resources. Some minor potential adverse impacts by the alternative's provision for expanded recreational use and enhanced visitor services. Facilities, and access to some areas of the park could be realized. Actions under this alternative would have a cumulative beneficial impact on archeological resources.

Section 106 Summary. The implementation of this alternative could include some minor adverse impacts on archeological resources. If impacts remain minor, there would be no adverse effects under section 106. Any adverse impacts resulting from moderate or major impacts would be mitigated through the use of *The Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation* and a memorandum of agreement with the state historic preservation office and Advisory Council on Historic Preservation to counteract such adverse effects.

Historic Structures and Buildings

Implementation of this alternative would generally have similar impacts on historic structures and buildings in Boca Chita Key Historic District and at Fowey Rocks Lighthouse as those listed under alternative 1 because the structures and buildings would be rehabilitated, preserved, and adaptively used in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. Some minor elements of historic fabric could be lost as a result of remodeling/rehabilitation efforts, and anticipated increasing visitation levels could result in loss of some historic fabric from inadvertent visitor use or vandalism. Providing access to the historic structures and buildings at the Jones homesite has the potential to result in additional localized, long-term, negligible to minor adverse impacts. As with alternative 1, impacts on historic structures and buildings would be localized, long-term to permanent, negligible to minor and generally beneficial.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. As described above, implementation of alternative 8 would result in negligible to minor adverse impacts and beneficial impacts. The impacts of alternative 8, in combination with negligible to minor adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long- and short-term beneficial impact. The adverse impacts of alternative 8, however, would be a small component of the adverse cumulative impact.

Conclusion. Implementation of this alternative would have the same impacts on historic structures and buildings in the Boca Chita Key Historic District as those listed under alternative 1 because they would be rehabilitated, preserved, and interpreted by the National Park Service in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. As with alternative 1, impacts on historic structures and buildings would be localized, long-term to permanent, and generally beneficial. Implementation of this alternative would have a long-term, beneficial impact on the Fowey Rocks Lighthouse because it would be preserved in accordance with the Secretary's Standards.

Actions under this alternative would have similar cumulative impacts on historic structures and buildings in the park as those listed under alternative 1. Implementation of this alternative would have cumulative beneficial impacts.

Section 106 Summary. The implementation of this alternative could include some minor adverse impacts on historic structures and buildings. If impacts remain minor, there would be no adverse effects under section 106. Any adverse impacts resulting from moderate or major impacts would be mitigated through the use of *The Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation* and a memorandum of agreement with the state historic preservation office and Advisory Council on Historic Preservation to counteract such adverse effects.

Cultural Landscapes

Implementation of this alternative would have the same impacts on cultural landscapes in the park as those listed under alternative 1 because potential landscapes would continue to be surveyed, inventoried, and evaluated under NRHP criteria, and the National Park Service would implement resource management policies that preserve the natural resource values and culturally significant character-defining patterns and features of Boca Chita, Porgy, and Totten Keys as well as other listed or determined eligible landscapes in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties With Guidelines for the Treatment of Cultural Landscapes*.

Although this alternative would emphasize strong cultural resource protection, enhancement of recreational opportunities and development of visitor services and facilities at Boca Chita, Elliott, and Porgy Keys could result in some minor impacts on the integrity of the listed and potential cultural landscapes at those visitor destination points. Expansion of recreational opportunities and development of enhanced visitor services throughout much of park lands and waters could also result in some long-term, minor, adverse impacts on the integrity of the potential parkwide maritime and cultural landscape. However, restoration activities, such as those at the Jones homesite would have localized, long-term beneficial impacts as well. Actions under this alternative, such as the creation of the marine reserve zone, would generally contribute to beneficial impacts to a potential marine cultural landscape.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1. As described above, implementation of alternative 8 would result in negligible to minor adverse impacts and beneficial impacts. The impacts of alternative 8, in combination with long-term, minor adverse impacts and beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term, minor adverse cumulative impact. The adverse impacts of alternative 8, however, would be a small component of the adverse cumulative impact.

Conclusion. Implementation of this alternative would have similar beneficial impacts on cultural landscapes as those listed under alternative 1. Although this alternative would emphasize strong cultural resource protection, provision for diversified recreational opportunities and development of enhanced visitor services and facilities in some areas of the park could result in long-term, minor, adverse impacts on the integrity of the potential cultural landscapes in the park.

Actions under this alternative would have similar cumulative impacts on cultural landscapes as those listed under alternative 1. This alternative's contribution to these cumulative impacts would be small.

Section 106 Summary. Implementation of this alternative could include some minor adverse impacts on cultural landscapes. If impacts remain minor, there would be no adverse effects under section 106. Any adverse impacts resulting from moderate or major impacts would be mitigated through the use of *The Secretary of the Interior's Standards and Guidelines for Documentation and Treatment of Cultural Landscapes* and a memorandum of agreement with the state historic preservation office and Advisory Council on Historic Preservation to counteract such adverse effects.

VISITOR EXPERIENCE

Diversity of Visitor Activities

Under this alternative, visitors would continue to have unrestricted access (as described in the multiuse zone) to most park waters (approximately 87%) to participate in a wide range of recreational opportunities such as motorboating, sailing, paddling, swimming, scuba diving, snorkeling, fishing, and nature study. The remaining park waters would have some limitations or changes (existing and new) that would potentially enhance, modify, limit, or prohibit visitor access and activities.

This alternative would require visitors to maintain slow speeds near the mainland and idle speed near the Sands Cut. It would also add a slow speed zone to Caesar Creek and an idle speed on the west side of Elliott Key beginning at Sands Key and extending south to Elliott Key Harbor. These reduced speed zones would help visitors focus attention on these relatively shallow, sensitive, and sometimes busy areas of the bay, thus enhancing visitor safety. Reduced speeds would help minimize damage to boats in docks and the frequency of boat groundings, which would be an indirect, long-term, beneficial impact on some visitors. For some visitors, this change would be perceived as a minor, adverse impact on their visitor experience while boating in the park. For other visitors, these reduced speeds would enhance their sense of safety and opportunities for swimming, wading, and fishing. The total area that would have reduced speed limits would be about 2% of park waters.

The noncombustion engine use zone would include two areas that generally are shallow, where caution is needed, and where different visitor experiences are available. West, Middle, and East Featherbed Banks would also be included in this zone. The prohibition of combustion engine use (with some limited exceptions) would potentially have a negative impact on those visitors who are used to accessing these areas of the park using combustion engines. For some visitors, this change would be perceived as a long-term adverse impact on their visitor experience while boating in the park. This zoning would potentially have a beneficial impact on the experience of many visitors who currently use or would like to use these areas of the park to explore the mangroves and more remote key environments in paddlecraft. Prohibiting combustion engines would enhance visitors' abilities to more successfully view wildlife and experience the natural sounds of the bay and mangrove environments as well as increase the likelihood that some visitors would be able to achieve a sense of solitude and tranquility. Also, boaters would have less likelihood of grounding in this zone, and flats anglers would have improved conditions for successful catches. This noncombustion engine use zone would affect less than 1% of park waters.

Under this alternative, Legare Anchorage would be reduced in size relative to current conditions. This would result in visitors having access to an additional 1,700 acres of reef waters for a full range of recreational activities (multiuse zone). The sensitive underwater archeological zone, which would be applied to a smaller area at Legare Anchorage, would continue to allow limited visitor access, as is currently the case. The addition of 1,700 acres to the multiuse zone

would provide visitors with enhanced opportunities for access and recreation, which would be a long-term beneficial impact on visitors' abilities to access and recreate in park waters.

The continued closure of West Arsenicker and Arsenicker Keys would not change. What would change under this alternative is the application of the sensitive resource zone 300 feet out from the shoreline of these keys. This would be a minor increase over the current 200-foot closure. Also, Soldier Key, Mangrove Key, and the water extending 300 feet from them as well as Swan Key would be closed to visitors. These areas are currently lightly used because of limited accessibility; however, those visitors who expect unrestricted access might find these closures to be a long-term, minor, adverse impact on their ability to experience the area.

Mainland areas north of Black Point Park and Marina and areas south of Convoy Point, the bay side of Old Rhodes, Totten Key, Rubicon Key, the southern keys, and all of Sands Key would be zoned nature observation. The relative inaccessibility of the mangrove forests and tropical hardwood hammocks naturally limits the range of visitor activities. Most visitors to these areas would probably experience few interactions with others and would have opportunities to explore, observe nature, and find solitude.

An area from Hawk Channel to the eastern park boundary (about 6% of park waters) would be placed in the marine reserve zone.

Visitors to this zone would be able to engage in most of their current activities, and the future concessioner would be able to take visitors here. However, in the marine reserve zone, visitors would not be able to engage in recreational and commercial fishing. For these visitors, this restriction would result in a minor to moderate, adverse impact on their visitor experience. However, because marine reserves worldwide have documented spillover effects where more fish and bigger fish leave the reserve and become available to visitors fishing outside the reserve, a long-term, beneficial impact would be expected for visitors fishing immediately outside the marine reserve zone.

Visitors who snorkel and scuba dive in the marine reserve zone would be able to experience a healthier, more natural coral reef than what is currently present, with larger and more numerous tropical reef fish and an ecologically intact reef system. The increased number of mooring buoys would make the snorkeling and scuba diving experience safer and easier. The prohibition on spearfishing, with the exception of exotic invasive lionfish and other invasive species identified by the park, also improves visitor safety. Therefore, a beneficial impact would be expected for visitors who snorkel and scuba dive in the marine reserve zone.

Anchoring in the marine reserve zone would be phased out, which some visitors may perceive as an adverse impact on their visitor experience due to their lack of freedom to choose their stationary location. However, this may not be a long-term impact as phase-out would occur as additional mooring buoys are installed, which would facilitate access to reefs and historic shipwrecks within this zone. The shift from anchoring to use of mooring buoys would improve resource conditions, which would improve visitor experience and create a safer environment for park visitors.

The addition of or relocation of mooring buoys and boundary markers would result in short-term, minor adverse impacts to visitors if they are unaware of the current location of buoys or find that their favorite mooring location is no longer available. While every effort would be made to communicate changes in a timely manner to the visiting public, inevitably there will be some amount of visitor confusion and frustration during the initial establishment of a marine reserve zone as adjustments are made, thus resulting in a short-term, minor adverse impact. Also, the fishing prohibition in the marine reserve zone may increase visitor confusion as well as

law enforcement requirements, thus resulting in a short-term, minor adverse impact. However, increased public outreach and/or law enforcement efforts would provide an opportunity to educate park visitors about the new limitations and benefits to park resources as well as reduce the potential for unlawful and/or negative visitor behaviors and would probably improve visitor safety, thus realizing a beneficial impact.

Visitor Services and Facilities

The northern half of Boca Chita Key would be designated as a visitor services / park administration zone. Some of the historic structures could be used for expanded visitor services that might be provided through on-site staff or wayside exhibits. This would be a beneficial impact on enhancing visitor opportunities to learn about and experience the key.

In the harbor area at Elliott Key, accessibility for visitors would be enhanced through the hardening of the trail connecting the harbor with the ocean side. This would be a beneficial enhancement of visitor opportunities to better access the ocean side of Elliott Key.

The park would consider using Adams Key as a back-up staging area for paddlecraft and might use Adams Key as a staging area for paddlecraft to access Porgy Key during special events or programs.

At Porgy Key, a dock for paddlecraft and interpretation of the historic Jones homesite would provide long-term beneficial improvements in visitor opportunities to learn about and experience that key.

Cumulative Impacts. Impacts associated with other past, present, and reasonably foreseeable actions would be similar to those described under alternative 1.

The actions of this alternative, especially park zoning that could enhance resource conditions such as the idle speed, slow speed, noncombustion engine use, sensitive resource, and nature observation zones, combined with these ongoing regional efforts, would have the potential to improve the quality of visitor activities in the region, especially related to fishing, nature viewing, and other resource-based recreational activities. There would also be improved visitor opportunities to learn from various sources regarding the importance and complexity of restoration efforts in a rapidly growing urban environment.

The *Fishery Management Plan* (2014) involves changes in current management strategies for both recreational and commercial fishing activities. With implementation of the *Fishery Management Plan*, the park anticipates the current condition of park fishery resource stocks would improve and the adverse impact of fishing on habitat within the park would be reduced. The long-term impacts of the *Fishery Management Plan* on fishery resources in the park would be beneficial. Because proposed management actions under this alternative are more protective of fish habitat than under alternative 1, there would be more benefits on park fishery resources realized from combining actions under this alternative with the implementation of the *Fishery Management Plan* than implementing the plan alone (as in alternative 1).

The recreational and commercial fishing prohibition in the marine reserve zone, combined with similar prohibitions and/or restrictions in waters outside the park boundary, could increase crowding in reefs open to fishing. This could be a long-term, moderate adverse impact to the visitor and park users experience.

The actions of this alternative to improve access and recreational opportunities and facilities would have the potential positive contribution of more and better public information about and access to the Biscayne Bay area and enhanced opportunities to learn

about and recreate there, especially enhanced paddling opportunities.

Alternative 8 would have beneficial and adverse impacts, and when combined with the beneficial impacts of other actions, would result in beneficial cumulative impacts on visitor experience in the area. The contribution to the cumulative impacts of alternative 8 would be small.

Conclusion. Additional speed limitations and new noncombustion engine use zones would exclude some visitors from these areas, which would be a long-term, minor to moderate, adverse impact to some users. The same zones would help, over time, to separate conflicting visitor uses, increase boating safety, increase the quality of nonmotorized opportunities, and increase opportunities for solitude, which would be long-term beneficial impacts on some visitor experiences. Enhancement of visitor contact opportunities in the Miami area, including in the Dinner Key area, and limited upgrades in visitor information, services, and facilities, would result in a long-term beneficial impact on some visitor experiences. Both long-term, minor to moderate, adverse and beneficial impacts would occur from implementing the marine reserve zone. This alternative would have small contributions to the impacts of other actions, resulting in beneficial cumulative impacts on visitor experience in the area.

NPS OPERATIONS AND FACILITIES

Actions under alternative 8 would generally have the same impacts on park operations and facilities at Convoy Point and Porgy, Adams, Elliott, and Boca Chita Keys as those described for alternative 6.

The establishment of a marine reserve zone would require additional park staff to manage. These actions would result in short-term and long-term, minor to moderate, adverse impacts on the park's budget because of equipment acquisition, employment of additional personnel, and additional equipment maintenance.

Creative use of partnerships and volunteers may also serve to bolster organizational capacity to undertake the proposed actions. After the initial implementation phase, and assuming adequate funding to meet existing and future park needs, this alternative could result in long-term efficiencies to park operations by reducing visitor conflicts and visitor-resource conflicts, which would be a long-term beneficial impact.

Assuming full funding, long-term impacts would be beneficial to park operations. Although under current funding reality and trends, the impacts may be more severe to park operations.

Cumulative Impacts. As discussed under alternative 1, past and ongoing cooperative planning and development projects in the Biscayne Bay region, such as the Biscayne Bay Partnership Initiative, *Miami-Dade County Comprehensive Development Master Plan*, and *Biscayne Bay Strategic Access Plan*, and NPS special resource studies, such as those for Miami Circle and Virginia Key Beach Park, have resulted in some long-term beneficial impacts on park operations and facilities. However, the impacts are almost impossible to measure.

This alternative, with its emphasis on strong natural and cultural resource protection, while providing a diversity of visitor experiences as well as establishment of potential visitor contact points outside the park, in combination with the aforementioned beneficial impacts of past and ongoing cooperative planning and development projects in the Biscayne Bay region, would generally result in long-term beneficial cumulative impacts on facilities and long-term, minor, adverse cumulative impacts on park operations. This alternative's contribution to these impacts would be beneficial for facilities and adverse for park operations.

Conclusion. Actions under alternative 8 would generally result in short-term, minor to moderate, adverse impacts on park operations during construction and implementation. There would also be long-term, minor adverse impacts that would be mitigated by increasing organizational capacity. Over time, the resolution of long-standing visitor use issues and conflicts would result in beneficial impacts to park operations. The overall cumulative impacts would be long term and beneficial for facilities and long term, negligible, and adverse for park operations. This alternative's contribution to these impacts would be small and beneficial for facilities and minor and adverse for park operations.

SOCIOECONOMIC ENVIRONMENT

Full implementation of this alternative would require 14 additional full-time equivalent staff positions to handle the increased workload for interpretation, cultural resource management, natural resource management, law enforcement, administrative support, and maintenance. Any additional employment along with the federal dollars that would be required to implement this alternative is expected to have a long-term beneficial impact on the regional economy.

Under this alternative, visitors would continue to have unrestricted access (multiuse zone) to most of park waters (approximately 85%) and would be able to engage in a wide range of recreational activities. Adverse impacts now occurring on fishery resources and habitat in the park would be reduced under this alternative due to the additions of idle speed, slow speed, noncombustion engine use, sensitive resource, and nature observation zones. It has been estimated that Biscayne Bay-related recreational activities created $3.8 billion in economic output, $2.1 billion in incomes, and 57,000 jobs (Hazen and Sawyer 2005). However, there are indications that Biscayne Bay is showing a decreased capacity, or resilience, to withstand external pressures that may affect the bay's long-term health, and its environmental and economic sustainability (Adams and Blair 2014). These zones would help over time to separate conflicting visitor uses, increase boating safety, and increase nonmotorized recreational opportunities. Economic studies beginning with Fisher and Krutilla (1972); Cichetti and Smith (1973, 1976); Prince and Ahmed (1988) have shown that congestion will cause recreationists to adjust their length of visit and satisfaction with their recreation experiences. The expected long-term beneficial impacts on park fishery resources and habitat as well as on some visitor experiences associated with implementation of these zones would result in a long-term beneficial impact on the sustainability of local tourism and resource-based economic activities. The proposed visitor services and facilities improvements would enhance the range and quality of recreational and interpretive opportunities available throughout the park, which has the potential to improve visitors' park experience and satisfaction and possibly increase the number of visitors and average length of park visit.

Similar to the no-action alternative, the continued presence of Biscayne National Park positively contributes to the value of surrounding private land.

Economic Effects of Marine Reserve Zones

Implementing alternative 8 would result in the creation of a marine reserve zone, which is a no-fishing area. The zone in this alternative would encompass about 6% of park waters.

There are many marine protected areas around the world, with varying levels of protection for marine habitats and different restrictions on fishing and recreation. Some areas limit fishing entirely (termed "no-fishing" areas or marine reserves) while allowing recreational use such as boating and

scuba diving. Other areas have limitations on fishing by factors such as species, type of gear used, season, or location. Few comprehensive studies have followed the economic effects of marine protected areas because of the associated complex socioeconomic conditions. This, and the variety of protected area designations, makes comparison of economic effects difficult, but some generalizations can be drawn from some of the larger studies that have been carried out.

In the Philippines, a portion of the Sumilon Island, Cebu, was closed to all fishing for 10 years, while swimming and scuba diving were allowed. After that period, fish abundance had increased three-fold, with the most significant increases among the most highly targeted species (White et al. 2002). Additionally, the yearly fish catch to fishers on the same reef but outside the sanctuary more than doubled, from 14 tons per square kilometer to 36 tons per square kilometer (Russ and Alcala 1996, cited in White et al. 2002). Food security, increased income from tourism, and pride in their protection role were also cited as major benefits of this sanctuary (White et al. 2002).

Leeworthy and Wiley (2003) investigated both qualitative and quantitative effects of the six "no-take" alternatives that were developed for the Channel Islands National Marine Sanctuary. In the context of the entire diverse economy of the study area, which included San Diego, Los Angeles, and Orange Counties, the authors concluded there would be no significant macroeconomic or fiscal effects from the marine reserves. However, they noted that local economies may be impacted, and that there may be significant effects on certain individuals or groups. In the short term, negative effects or costs may impact the commercial fishing industry and the recreational fishing community because of displacement and loss of income, including secondary losses to associated industries. In the long term, however, these groups may realize benefits because the improved health of fishery resources in the marine reserve would lead to improved fish stocks outside the reserve. The authors found that recreational users who engage in scuba diving, sailing, sightseeing, and wildlife viewing would realize benefits from marine reserves, as would the service providers supporting these activities. The authors note that human response—both from the commercial and recreational fishing sectors and by recreational and passive users—is highly adaptive, and that financial losses are not always realized if these groups adapt quickly to the reserve zones (Leeworthy and Wiley 2003).

Although the establishment of a marine reserve zone could result in some short-term, negligible and adverse impacts on local businesses that formerly took visitors out to fish in the marine reserve zone, the expected spillover effect, where targeted fish species could grow larger and therefore increase in reproductive output, would generally contribute to long-term, beneficial impacts on recreational fishing and associated service-related sectors.

Limited commercial fishing currently takes place in the proposed marine reserve zone. Parkwide phase-out of commercial fishing is addressed in the separate and previously described *Fishery Management Plan*. Establishment of a marine reserve zone would prohibit commercial and recreational fishing in this zone immediately, including the ballyhoo lampara net fishery, after passage of a park special regulation. This would have a localized, negligible adverse impact on commercial fishing as this activity would have to occur elsewhere in or out of the park.

Nonconsumptive recreation benefits currently taking place in the area, such as snorkeling and scuba diving, would continue in the proposed marine reserve zone. Economic studies have shown that snorkelers and scuba divers would increase trips with improvements in fish abundance, water visibility, and coral quality (Bhat 2003), all of which are expected to occur under this alternative. An increase in recreational scuba

diving may increase coral reef damage due to a higher frequency of diver-coral contacts (Chadwick-Furman 1997; Krieger and Chadwick 2012). This would be mitigated through an increased ecotourism management strategy to specifically educate divers about the extra care needed when recreating around coral reefs. Therefore, a long-term beneficial impact would be expected for snorkeling- and scuba diving-related businesses.

Due to a shift in visitation patterns, the net effect in the number of visitors or average length of visit would be expected to be negligible. Therefore, under this alternative it is expected there would be no effect on tourism-related businesses.

Actions under this alternative are anticipated to provide park coral reefs the greatest opportunity for reef ecosystem recovery and increased reef resiliency. Johns et al. (2003) report that reef-related expenditures in Miami-Dade County generate $614 million in income and sustain 19,000 jobs in Miami-Dade County and generate nearly $4 billion dollars in sales in the southeast Florida region annually. The establishment of a marine reserve zone has the potential to help sustain the current contributions southeast Florida coral reefs provide to the regional socioeconomic environment.

Cumulative Impacts. Impacts associated with past and ongoing partnership and planning efforts, presence of nearby recreational opportunities, and expanded developed areas according to city and county plan with its associated population and park visitation increase would be similar to those described under alternative 1.

The actions of this alternative, especially a marine reserve zone and park zoning that could enhance resource conditions, improve access and recreational opportunities and facilities, combined with the ongoing regional efforts, would have the potential to safeguard and improve the sustainability of the local and regional recreational and service-related sectors by ensuring a quality visitor experience and satisfaction, especially related to fishing, nature viewing, and other resource-based recreational activities resulting in a long-term beneficial impact to the regional socioeconomic environment.

The long-term socioeconomic impacts of phasing out commercial fishing in the park are expected to be realized with implementation of the *Fishery Management Plan* and are assessed in that plan. For more information on the *Fishery Management Plan*, please visit http://www.nps.gov/bisc/parkmgmt/fishery-management-plan.htm.

Alternative 8 would contribute a small increment to the above impacts of other past, present, and future actions on socioeconomic conditions and, when considered in combination with other actions, would result in a beneficial cumulative impact.

Conclusion. The strong protection of natural and cultural resources that is expected to enhance resource conditions would have a long-term beneficial impact to the regional socioeconomic environment. Upgrades in park visitor services and facilities would support regional efforts to enhance tourism and increase visitor access and recreational opportunities in the area.

There would be long-term, localized, negligible, adverse impacts to commercial fishing due to the establishment of a marine reserve zone. There would be long-term beneficial impacts for snorkeling- and scuba diving-related businesses from the continuation of nonconsumptive recreational uses in the marine reserve zone. The expected spillover effect, where targeted fish species could grow larger and therefore increase in reproductive output, would generally contribute to long-term, beneficial impacts on recreational fishing and associated service-related sectors.

The overall cumulative effects would be beneficial with this alternative contributing a small increment.

UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts are defined here as impacts that cannot be fully mitigated or avoided.

Existing moderate or major adverse impacts to park fishery resources, federally listed sea turtles, smalltooth sawfish, stony corals, submerged aquatic communities, and natural soundscapes would be expected to continue in the majority of park waters included in the multiuse zone. These impacts are primarily caused by the relatively unrestricted use of motorized boats as well as fishing and marine debris that continue to impact most park waters and submerged habitats.

New actions proposed under this alternative would reduce some or all of those impacts to many of the most sensitive areas of park waters. Thus there would be no new unavoidable moderate or major adverse impacts expected as a result of implementing alternative 8.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Alternative 8 would have a small potential for some commitments of resources because it would involve a minimum of new development (e.g., trails, primitive dock, and marine signage). However, most of the development being proposed is minimal, such as trails with only small areas of potential impact. Most proposed development would be built in previously disturbed areas, so it would not result in irreversible or irretrievable commitments of resources. Cultural resources would continue to be protected through active preservation maintenance.

NATURAL OR DEPLETABLE RESOURCES AND ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

Whenever feasible, the National Park Service strives to maximize the use of renewable resources and energy and therefore minimize the use of depletable resources. However, it is not possible with today's technologies to cost-effectively avoid all use of depletable resources in building and operating facilities. Implementing alternative 8 would involve a minimal increase in energy requirements.

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