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INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FOR THE 45th SPACE WING

Cape Canaveral Air Force Station
Patrick Air Force Base
Malabar Transmitter Annex
Jonathan Dickinson Missile Tracking Annex

Prepared for:

45th Space Wing

Under contract

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Signature Page

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

45TH SPACE WING

This Integrated Natural Resources Management Plan (INRMP) meets the requirements of the Sikes Act (16 US Code [USC] 670a et seq.) as amended and has been prepared in accordance with regulations, standards, and procedures of the Department of Defense (DoD) and the United States Air Force (USAF). To the extent that resources permit, the 45th Space Wing (45 SW) will implement the actions associated with this plan and will strive to meet its goals and objectives.

By their signatures below, or an enclosed letter of concurrence, all parties have reviewed this plan and grant their concurrence and acceptance.

_____ _____

NINA M. ARMAGNO, Brigadier General, USAF Date
Commander, 45th Space Wing

_____ _____

Regional Director Date
US Fish and Wildlife Service

_____ _____

Regional Director Date
Florida Fish and Wildlife Conservation Commission

_____ _____

PACE WILBER, HCD Branch Chief, South Atlantic Habitat Conservation Division Date
National Marine Fisheries Service

_____ _____

RACHEL SWEENEY, PRD Branch Chief, South Atlantic Protected Resources Division Date
National Marine Fisheries Service

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ANNUAL REVIEW AND COORDINATION PAGE

This page is used to certify the annual review and coordination of the Integrated Natural Resources Management Plan (INRMP) for US Air Force (USAF) 45th Space Wing (45 SW) at Cape Canaveral Air Force Station (CCAFS), Patrick Air Force Base (PAFB), Malabar Transmitter Annex (MTA), and Jonathan Dickinson Missile Tracking Annex (JDMTA) in Brevard and Martin Counties, Florida. Detailed annual review and coordination documentation is maintained within **Appendix A**.

With the signature below, the certifying official acknowledges that the annual review and coordination of the INRMP has occurred for the specified year.

YEAR: 2016	**45th Space Wing CEIE Certification of Annual Review**
	Print Name & Title:
	Signature:
YEAR: 2017	**45th Space Wing CEIE Certification of Annual Review**
	Print Name & Title:
	Signature:
YEAR: 2018	**45th Space Wing CEIE Certification of Annual Review**
	Print Name & Title:
	Signature:
YEAR: 2019	**45th Space Wing CEIE Certification of Annual Review**
	Print Name & Title:
	Signature:

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Chapter 1. Executive Summary

The Integrated Natural Resources Management Plan (INRMP) is the primary guidance document and tool for managing natural resources by the US Air Force (USAF) 45th Space Wing (45 SW) at Cape Canaveral Air Force Station (CCAFS), Patrick Air Force Base (PAFB), Malabar Transmitter Annex (MTA), and Jonathan Dickinson Missile Tracking Annex (JDMTA). The approximately 11-acre JDMTA is located on state-owned land leased to the USAF in Martin County, Florida. The remaining three installations encompass 18,442 acres of federally owned land in Brevard County, Florida. All facilities are ultimately under the command of the 45 SW with the primary purpose of delivering assured space launch and range and combat capabilities for the US. The 45 SW installations, due to their geographic location and the nature of these facilities, contain diverse habitats and species that require natural resources management. The management of the 45 SW installations is conducted in a way that provides for sustainable, healthy ecosystems, complies with applicable environmental laws and regulations, and provides for no net loss in the capability of military installation lands to support the military mission of the installation. Installation commanders use INRMPs to manage natural resources more effectively to ensure that installation lands remain available and in good condition to support the installation's military mission over the long term.

This INRMP is an update and reorganization of the 2008 45 SW INRMP, which was developed for the planning period from fiscal year (FY) 2008 through FY 2013. It is required as a result of the presence of several federally endangered and threatened species (e.g., Florida scrub-jay [*Aphelocoma coerulescens*], loggerhead sea turtle [*Caretta caretta*], green sea turtle [*Chelonia mydas*], leatherback sea turtle [*Dermochelys coriacea*], and southeastern beach mouse [*Peromyscus polionotus niveiventris*] (SEBM), presence of state listed species, and significant vegetation management, including prescribed fire. The development of the 2008 INRMP and this update was done in cooperation with the US Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and Florida Fish and Wildlife Conservation Commission (FWC). The details of the current and future review processes are described in **Section 9.2 and Section 9.3** of the INRMP.

The Sikes Act Improvement Act (SAIA) of 1997, 16 US Code (USC) § 670a *et seq*., as amended, requires federal military installations with significant natural resources to develop a long-range INRMP and implement cooperative agreements with other agencies. An INRMP is required by Department of Defense (DoD) and USAF Policy for CCAFS, PAFB, MTA and JDMTA because the 45 SW has a robust military mission that requires conservation measures to manage federal and state listed species and vegetation. The INRMP is intended to be consistent with the SAIA. Specific goals identified by the INRMP are:

- GOAL 1: Protect federally listed threatened and endangered (T&E) species and their habitat while ensuring mission sustainability.
- GOAL 2: Manage native plants and animals by promoting biodiversity and utilizing methods to enhance these species and their habitats.
- GOAL 3: Manage invasive plant species to minimize impacts to native ecosystems and to support mission sustainability.

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- GOAL 4: Employ ecosystem management principles to manage 45 SW natural resources and promote biodiversity.
- GOAL 5: Develop and maintain a comprehensive data collection and processing system for management of 45 SW natural resources.
- GOAL 6: Protect 45 SW natural resources through training, education, and outreach and ensure compliance with applicable environmental laws and regulations.

These goals are supported in the INRMP by objectives and projects, as well as management strategies and specific actions to achieve these goals. Goals and objectives are listed in **Chapter 8** of the INRMP, and projects and activities are summarized in **Table 8-1**. This INRMP provides a description of the installation and the military missions, the environment on the installation, and specific natural resource management designed for sustainable military training. The implementation of this INRMP will ensure the successful accomplishment of the military mission while promoting adaptive management that sustains ecosystem and biological integrity and provides for multiple uses of natural resources. It will also ensure that management efforts of the 45 SW at these installations is consistent, integrated and with as little redundancy as possible.

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Chapter 2. General Information

2.1 Purpose and Scope

The Integrated Natural Resources Management Plan (INRMP) is the primary guidance document and tool for managing natural resources by the US Air Force (USAF) 45th Space Wing (45 SW) at Cape Canaveral Air Force Station (CCAFS), Patrick Air Force Base (PAFB), Malabar Transmitter Annex (MTA), and Jonathan Dickinson Missile Tracking Annex (JDMTA). The approximately 11-acre JDMTA is located on state-owned land leased to the USAF in Martin County, Florida. The remaining three installations encompass 18,442 acres of federally owned land in Brevard County, Florida (see **Figure 3-1**). The management of the 45 SW installations is conducted in a way that provides for sustainable, healthy ecosystems, complies with applicable environmental laws and regulations, and provides for no net loss in the capability of military installation lands to support the military mission of the installation. Installation commanders can use INRMPs to manage natural resources more effectively to ensure that installation lands remain available and in good condition to support the installation's military mission over the long term.

This INRMP is intended to be consistent with the Sikes Act Improvement Act (SAIA) of 1997, 16 US Code (USC) § 670a *et seq*., as amended, Department of Defense Instruction (DoDI) 4715.03, *Natural Resources Conservation Program*, and Air Force Instruction (AFI) 32-7064, *Integrated Natural Resources Management* (see **Section 2.3** for more information). This INRMP integrates all aspects of natural resources management with the rest of the 45 SW's mission, and therefore becomes the primary tool for managing the ecosystem and habitat at each facility while ensuring the successful accomplishment of the military mission at the highest possible levels of efficiency. The INRMP is the guide for the management and stewardship of all natural resources present on the 45 SW installations. A multiple-use approach will be implemented to allow for the presence of mission-oriented activities, as well as protecting environmental quality through the efficient management of natural resources.

This INRMP is an update and reorganization of the 2008 45 SW INRMP, which was developed for the planning period from fiscal year (FY) 2008 through FY 2013, and is the result of a review for operation and effect done by the US Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Florida Fish and Wildlife Conservation Commission (FWC) and 45 SW. The review for operation and effect completed by all parties in February 2014 (see **Appendix A**) determined that only an INRMP update is required since there are no major military mission changes, and program or management philosophy changes. In addition, no input was received from the USFWS, NMFS, or FWC that resulted in changes to the way natural resources are managed at the 45 SW installations (see **Section 9.2** for review process). The projects identified in **Chapter 10** include recurring or ongoing projects as well as newly identified projects needed for the implementation of the existing program.

The 45 SW INRMP has been updated and reorganized in accordance with (IAW) the E-Plan INRMP Template developed by the USAF. The Plan is organized into five principal sections: (1) an overview of the current status and conditions of the natural resources; (2) identification of potential impacts on natural resources; (3) discussion of the key natural resource management issues; (4) management recommendations that incorporate goals and objectives for each of the

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key natural resource management issues; and (5) specific activities and projects for effective implementation of the INRMP. Detailed operational component plans for specific natural resources, such as the Florida scrub-jay (*Aphelocoma coerulescens*) and nesting sea turtles, are included in **Appendix C**. The INRMP has been updated and reorganized as follows:

- An INRMP Implementation Analysis is provided to summarize what projects and programs have been implemented in **Section 9.3.1**.
- The plan has been reorganized per the E-Plan INRMP Template.
- Management goals and objectives have been reorganized and consolidated.
- Natural resources data and species lists have been updated to include new data and changes in the status of rare species.
- The Florida State Wildlife Action Plan (SWAP) has been incorporated.

2.2 Management and Philosophy

The INRMP was developed using an interdisciplinary approach and information gathered from a variety of organizations. Information and guidance was also solicited from a variety of federal, state, and local agencies and groups. An INRMP Task Force was formed, which included key 45 SW personnel and individuals from various agencies that have an interest in the management of the 45 SW natural resources. Representatives from the following Federal and state agencies comprised the Task Force: USFWS, NMFS, and FWC. The INRMP Task Force ensures that information concerning the natural resources on or in the vicinity of the 45 SW installations is accurate and presented IAW local and regional management strategies, where feasible. This approach allows for insight into possible operational alternatives, which could reduce negative impacts on the natural resources on the 45 SW properties and in surrounding areas. INRMP Task Force meeting minutes and correspondence with the agencies is provided in **Appendix A**.

Participation on the INRMP Task Force by representatives from the USFWS, NMFS and FWC satisfies the provisions of the SAIA (16 USC §670a et seq.) as described in **Section 2.3**. The INRMP Task Force is also the venue for achieving mutual agreement of the parties concerning conservation, protection, and management of fish and wildlife resources, as well as for completing the annual reviews and 5-year reviews for operation and effect as described in **Section 9.2**.

Enabling long-term use of 45 SW installations for military and other government use is the primary purpose of natural resources management at these facilities. The 45 SW INRMP is a military mission-driven plan, created with the paired goals:

- To allow for and support the military mission at levels necessary to maintain a full readiness posture for national defense and civil missions; and
- To provide for sustainable management of natural resources with an ecosystem focus, consistent with federal, state, and local regulations.

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The INRMP presents practicable alternatives and recommendations that allow for the protection and enhancement of natural resources and conservation of existing ecosystems, while minimizing impacts on the military mission of the 45 SW. Consequently, the implementation of some of these recommendations may sacrifice improvement of the 45 SW natural resources in deference to the safety and efficiency of the military mission. The 45 SW recognizes that on-going military training and associated mission activities can consume and potentially damage the natural resources on mission land, and that successful execution of their mission in perpetuity is dependent upon sustainable land use and the conservation of these natural resources. The 45 SW is committed to the planned, deliberate management of natural resources, supporting the installation operational mission, meeting or exceeding stewardship requirements, partnering in local and regional conservation initiatives, and enhancing the quality of life for its personnel and guests.

The 45 SW recognizes that it is a steward of publicly-owned natural resources and, as compatible with the military mission, safety, and security requirements, that it has a responsibility to provide access for the use and enjoyment of these resources in a manner consistent with the resources' ability to support such use. The 45 SW also recognizes the responsibility to ensure that the natural resources entrusted to their care are sustained in a healthy condition for scientific research, education, and other compatible uses by future generations.

2.2.1 Environmental Management System

The Environmental Management System (EMS) for 45 SW is part of the overall USAF management system, and includes organizational structure, planning, responsibilities, practices, procedures and processes, and resource allocation for developing, implementing, achieving, reviewing, and maintaining environmental commitments. The International Standards Organization (ISO) 14001 EMS model used by the USAF and other Federal agencies leads to continual improvement based upon a cycle of "plan, do, check, act." With the following steps:

- Planning, including identifying environmental aspects and establishing goals [plan];
- Implementing, including training and operational controls [do];
- Checking, including monitoring and corrective action [check]; and
- Reviewing, including progress reviews and acting to make needed changes to the EMS [act].

This INRMP directly supports the 45 SW and USAF EMS. Annual review of the INRMP in conjunction with the USFWS, NMFS, and FWC will be conducted in order to support the EMS. Annual reviews are discussed in **Section 9.2** and monitoring of implementation is discussed in **Chapter 9**.

2.2.2 Ecosystem Management

Natural resources at the 45 SW installations will be managed with an ecosystem management approach as directed by AFI 32-7064 and DoDI 4715.03. Ecosystem management may be

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defined as management to restore and maintain the health, sustainability, and biological diversity of ecosystems while supporting sustainable economies and communities. The goal of ecosystem management on military lands is to ensure that military lands support present and future training and testing requirements while preserving, improving, and enhancing ecosystem integrity. As described in DoDI 4715.03 and AFI 32-7064, ecosystem management will incorporate the following elements as described in **Table 2-1**.

Table 2-1. Elements and Principles of Ecosystem Management

DoDI 4715.03 Elements	
1	Avoid single-species management and implement an ecosystem-based multiple species management approach, insofar as that is consistent with the requirements of the ESA
2	Use an adaptive management approach to manage natural resources in response to climate change
3	Evaluate and engage in the formation of local or regional partnerships that benefit the goals and objectives of the INRMP
4	Use the best available scientific information in decision-making and adaptive management techniques in natural resource management
5	Foster long-term sustainability of ecosystem services
AFI 32-7064 Principles	
1	Maintain or restore native ecosystem types across their natural range where practical and consistent with the military mission
2	Maintain or restore ecological processes such as wildland fire and other disturbance regimes where practical and consistent with the military mission
3	Maintain or restore the hydrological processes in streams, floodplains, and wetlands when feasible
4	Use regional approaches to implement ecosystem management on an installation by collaboration with other DoD components as well as other federal, state and local agencies, and adjoining property owners
5	Provide for outdoor recreation, agricultural production, harvesting of forest products, and other practical utilization of the land and its resources, provided that such use does not inflict long-term ecosystem damage or negatively impact the USAF mission

Biodiversity is the degree of variation of life within a given ecosystem, biome, or an entire planet. The DoD's challenge is to manage for biodiversity in a way that supports the military mission. The INRMP is identified by DoD as the primary vehicle for conserving biodiversity on military installations. Specific management practices identified in this INRMP have been developed to enhance and maintain biological diversity within the ecosystems at 45 SW installations. The outcome of biodiversity conservation on DoD-managed land includes the items in **Table 2-2**.

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Table 2-2. Outcomes of Biodiversity Conservation

Outcomes	
1	Maintain or restore remaining native ecosystem types across their natural range of variation
2	Maintain or reestablish viable populations of native species on an installation, when practical
3	Maintain ecological processes, such as disturbance regimes, hydrological processes, and nutrient cycles, to the extent practicable
4	Manage and monitor resources over sufficiently long time periods to allow for adaptive management and assessment of changing ecosystem dynamics

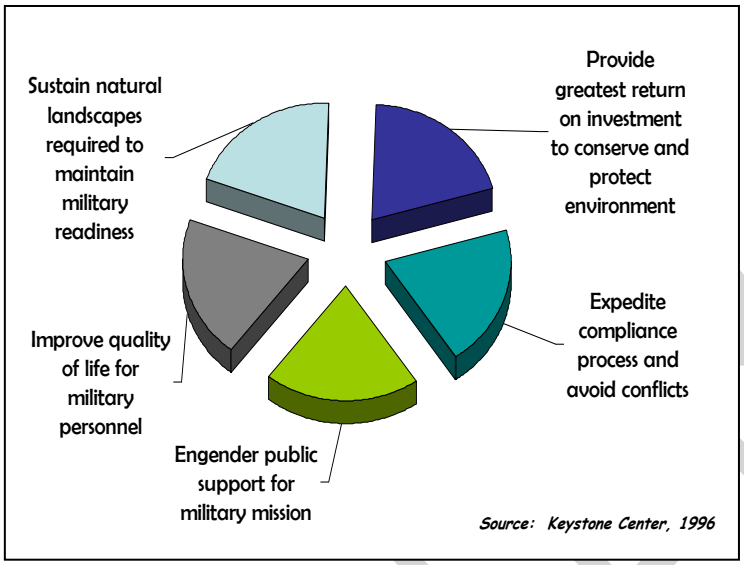

Figure 2-1. Why Conserve Biodiversity on Military Lands?

Ecosystem management includes biodiversity conservation and invasive species control as integral parts of ecosystem management. USAF installations should maintain or reestablish viable populations of all native species when practical and consistent with the military mission. USAF installations should also identify the presence of exotic and invasive species, and implement programs to control and/or eradicate those species. When feasible, USAF installations should develop joint control strategies with other federal, state, and local cooperating agencies and adjacent landowners to increase the effectiveness of control measures and for the benefits illustrated in **Figure 2-1**.

Ecosystem management should include developing and implementing management strategies oriented toward the conservation of those species and communities when practical and consistent with the military mission.

2.2.3 Goals & Objectives

Goals and objectives provide the framework for the natural resources management programs. Goals provide a general guiding direction for each technical area and logical objectives that facilitate achieving those goals are described for any priority issues within each technical area. The objectives then drive the development of activities and projects to achieve those objectives. Goals and objectives are described in **Chapter 8** for CCAFS, PAFB, MTA and JDMTA. Activities and projects, and the objectives they support, are described in **Chapter 10**. The goals identified in **Chapter 8** are reflected below.

- GOAL 1: Protect federally listed threatened and endangered (T&E) species and their habitat while ensuring mission sustainability

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- GOAL 2: Manage native plants and animals by promoting biodiversity and utilizing methods to enhance these species and their habitats
- GOAL 3: Manage invasive plant species to minimize impacts to native ecosystems and to support mission sustainability
- GOAL 4: Employ ecosystem management principles to manage 45 SW natural resources and promote biodiversity
- GOAL 5: Develop and maintain a comprehensive data collection and processing system for management of 45 SW natural resources
- GOAL 6: Protect 45 SW natural resources through training, education, and outreach and ensure compliance with applicable environmental laws and regulations

2.3 Authority

2.3.1 Natural Resources Laws, Regulations & Policy

The SAIA requires Federal military installations with significant natural resources to cooperatively develop a long-range INRMP and implement cooperative agreements with other agencies.

The DoDI 4715.03, *Natural Resources Conservation Program*, identifies the DoD policies and procedures concerning natural resources management and INRMP reviews, public comment, and endangered species consultation. INRMPs are required to be jointly reviewed by the USFWS, NMFS, state conservation agency, and military proponent for operation and effect on a regular basis, but not less often than every five years. Minor updates and continued implementation of an existing INRMP do not require an opportunity for public comment. Major revisions to an INRMP do require an opportunity for public review. The degree of endangered species consultation when updating or revising an INRMP depends upon the management strategies identified in the INRMP and the amount of past consultation. Most updates and revisions will not require formal consultation. Endangered Species Act (ESA) Section 7 consultation is required for INRMPs that contain management strategies that may affect federally listed species or designated critical habitat. The need for such consultation should become apparent during the review for operation and effect and implemented if necessary as part of a revision.

AFI 32-7064, *Integrated Natural Resources Management,* provides guidance on how the USAF implements the SAIA. This guidance addresses what an INRMP is, its purpose, who prepares it, the criteria for determining which installations require an INRMP, coordination requirements, reporting requirements, review requirements, ESA consultation requirements, public access policies, the requirement for no net loss of capability to support military training, and a few other topics. This is a general guidance document on the purpose, development, implementation, and update/revision of INRMPs. It requires INRMPs to be developed jointly with the USFWS, NMFS, and the state conservation agency. It requires INRMPs to support the military mission and details the review process with emphasis on joint annual reviews and review for operation and effect no less than every five years. The guidance also indicates that the review for operation and effect will determine if a revision is required. A revision is not

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required if the cooperating agencies agree that an INRMP is meeting the intent of the SAIA. Instead, the INRMP can be updated as necessary and implementation continued.

In addition to these fundamental INRMP regulations and guidance, this INRMP has been prepared pursuant to applicable federal, state, local, and USAF laws, regulations and policies that pertain to natural resources management on military land, which are summarized in **Appendix N**.

2.3.2 National Environmental Protection Act Compliance

2.3.2.1 Environmental Impact Analysis Process

The Environmental Impact Analysis Process (EIAP) is the process by which Federal agencies facilitate compliance with environmental regulations. The primary legislation affecting these agencies' decision-making process is the National Environmental Policy Act of 1969 (NEPA) (42 USC § 4321 *et seq*.). NEPA requires that Federal agencies consider potential environmental consequences of proposed actions. The law's intent is to protect, restore, or enhance the environment through well-informed Federal decisions. The Council on Environmental Quality (CEQ) was established under NEPA for the purpose of implementing and overseeing Federal policies as they relate to this process.

The adoption of an INRMP can be considered a major Federal action as defined by 40 CFR Section 1508.18 of the CEQ regulations. USAF policy requires an analysis of potential environmental impacts for the implementation of an INRMP, although a complete Environmental Assessment (EA) is not necessarily required, as individual actions and projects undergo their own NEPA analysis.

CEQ regulations require intergovernmental notifications prior to making any detailed statement of environmental impacts. The 45 SW notifies relevant federal, state, and local agencies and allows them sufficient time to make known their environmental concerns specific to a Proposed Action. Comments and concerns submitted by these agencies during the Interagency/ Intergovernmental Coordination for Environmental Planning (IICEP) process are subsequently incorporated into the analysis of potential environmental impacts. This coordination fulfills requirements under Executive Order (EO) 12372, *Intergovernmental Review of Federal Programs*. Furthermore, public participation in decision making on new proposals is required. Consideration of the views and information of all interested persons promotes open communication and enables better decision-making. Agencies, organizations, and members of the public with a potential interest in the Proposed Action, including minority, low-income, disadvantaged, and Native American groups, are urged to participate. A record of public involvement, agency coordination, and Native American consultation associated with this NEPA analysis is provided in **Appendix M**.

2.3.2.2 NEPA Analysis for INRMP Implementation

The EIAP for the implementation of the original (first) INRMP, with additional analysis included in the AF 813 for this updated INRMP, was conducted IAW NEPA, CEQ *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act* (40 Code of

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Federal Regulations [CFR] § 1500-1508), and 32 CFR Part 989. The EIAP and decision-making process for the Proposed Action (implementation of this 45 SW INRMP) involves an examination of all environmental issues pertinent to the action proposed. An environmental impact analysis was conducted with the 2008 INRMP, but has not been replicated here. The original Finding of No Significant Impact (FONSI) and analysis still stands for this updated INRMP. During the review process of the 2008 INRMP, the USFWS, NMFS, and FWC determined the INRMP required an update to incorporate new data and implementation achieved, not a revision. All parties agreed that the 2008 INRMP provided adequately for the conservation and rehabilitation of the natural resources on the installations. Therefore, an environmental impact analysis was not required for this INRMP update as the installation mission, size, management or natural features have not changed significantly; the anticipated effects on natural resources have not changed substantially since the 2008 INRMP.A copy of applicable NEPA documentation for this INRMP is included in **Appendix M**.

2.3.2.3 NEPA Analysis for Specific Projects

The EIAP for the implementation of this 45 SW INRMP does not include a NEPA analysis of effects for individual actions or projects. Individual actions or projects that have the potential to impact the environment will be analyzed separately. The initial step for any activity that might impact the environment by the 45 SW is to complete USAF Form 813: *Request for Environmental Impact Analysis*. The form is prepared to aid in the development of the assessment, providing information on the proposed action and its alternatives, purpose, and potential environmental effects. This allows the proponent to identify potential environmental impacts early and facilitates making a determination about whether an EA or Environmental Impact Statement (EIS) might be required for a specific action. If the action is not covered by a categorical exclusion, then an EA is prepared to determine if there are potential significant impacts. If potential significant impacts are identified, either while completing USAF Form 813 or during the EA, then an EIS is prepared. The majority of natural resources management actions are covered by categorical exclusions.

2.4 Integration with Other Plans

2.4.1 45 SW Plans

By its nature, an INRMP is multidisciplinary and provides the summary for natural resources at a specific installation. As a result, information from an INRMP is incorporated into other plans and other plans help identify management priorities and potential impacts to natural resources. The INRMP is integrated with a number of 45 SW plans including:

- **Base General Plans for 45 SW –** provide background and rationale for the policies and programming decisions related to land use, resource conservation, facilities and infrastructure development, and operations and maintenance for CCAFS (USAF 2013a) and PAFB (USAF 2011).
- **Integrated Pest Management Plan (IPMP) for 45 SW (included in Appendix L) –** plan for management of pest species to minimize impact to mission, natural resources and the environment (USAF 2006).

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- **Integrated Cultural Resources Management Plan (ICRMP) for 45 SW –** plan for management of cultural resources, including legal requirements, known cultural resources, processes and responsibilities (USAF 2009a)
- **Wildland Fire Management Plan (WFMP) for 45 SW (included in Appendix J) –** provides summary of the wildland fire program, including training, techniques, processes, responsibilities, and cooperators.
- **Bird Aircraft Strike Hazard (BASH) Hazard Plan for 45 SW (included in Appendix K) –** provides summary of the BASH program, including techniques, processes, responsibilities and management recommendations for CCAFS and PAFB (USAF 2010).
- **Storm Water Pollution Prevention Plan (SWPPP) –** plans for prevention and management of stormwater for CCAFS (VZ Technologies 2014a) and PAFB (SpecPro 2010).
- **Skid Strip Area Development Plan–** plan that addresses development/expansion around the CCAFS airfield, which includes increasing clear zones to meet USAF standards; this also includes scrub jay habitat mitigation associated with airfield clearance activities for the skid strip at CCAFS (USAF 2004)

2.4.2 Florida State Wildlife Action Plan

During the INRMP development process, the 45 SW consulted the draft *Florida's Wildlife Legacy Initiative: Florida's State Wildlife Action Plan* (SWAP) (FWC 2012a) to ensure INRMP goals, objectives, and strategies are consistent with Florida's overall statewide and habitat-specific plans. Florida's SWAP is a strategic vision of the integrated conservation efforts needed to sustain the broad array of wildlife in the state. The purpose of Florida's SWAP is to serve as a starting point for building a common framework for Florida's numerous wildlife conservation partners. Florida's SWAP is available at *http://myfwc.com/conservation/special-initiatives/fwli/action-plan/*.

The goals of Florida's SWAP are:

- Goal 1: Use Florida's Wildlife Legacy Initiative framework to coordinate natural resource conservation by (1) implementing and revising the 2005 SWAP; (2) developing and maintaining partnerships; and (3) managing the State Wildlife Grants Program.
- Goal 2: Facilitate habitat conservation efforts on the following high-priority habitat categories to improve their health and resiliency and to achieve their long-term ecological sustainability statewide: sandhill, scrub, softwater stream, spring and spring run, coral reef, and seagrass.
- Goal 3: Obtain information on the life history, status, trend, population dynamics and management, and needs for Species of Greatest Conservation Need (SGCN).
- Goal 4: Enhance monitoring of priority species and habitats by developing a tracking system for species and habitats identified in the SWAP.
- Goal 5: Develop a geographic information system (GIS) application that identifies the most important cooperative conservation focal areas for Florida's terrestrial, freshwater, and marine ecosystems. Merge the various existing GIS planning applications in order to generate an integrated land and water cover map for Florida. Make it available on Arc Internet Mapping Service.

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Key statewide threats include alterations of the physical environment, degradation of water resources, incompatible fire management, and introduced plants and animals. Key conservation challenges include public awareness, information management, data gaps, and partnerships. While all INRMP goals, objectives, and strategies were found to be consistent with Florida's SWAP, not all of them contribute specifically to one of the SWAP's goals or conservation actions. The SWAP identifies very high, high, medium and low priority conservation actions and habitat types for Florida.

High priority habitat present on the 45 SW installations (CCAFS and JDMTA) includes scrub. The JDMTA is located in the Florida Southeast Coast Basin, which is one of the highest ranking enhancement basins for watersheds within Florida's SWAP. The SGCN list identifies the broad range of Florida's animal species that are imperiled or at risk of becoming imperiled in the future. After assessing all native freshwater, marine, and terrestrial wildlife species known to occur within Florida, 1,036 SGCN were identified, including 21 amphibians, 52 mammals, 56 reptiles, 161 birds, 78 fish, and 668 invertebrates. SGCNs include Federal and state listed species as well as species that met the SWAP's definition of rare (10,000 or fewer individuals) or biologically vulnerable (vulnerable to extinction). SGCN also include keystone species that play a critical role in maintaining the structure of an ecological community, and taxa of concern that have at least a moderate risk of extinction in the future. Numerous SCGN occur within 45 SW installations that benefit from the natural resources program. Fish and wildlife management and rare species management are discussed in **Section 7.2** and Section **7.5**, respectively. For a complete list of Florida SGCN, refer to the SWAP. Animal species known to occur within the 45 SW installations are listed in **Appendix F**.

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Chapter 3. Installation Overview

This chapter presents an overview of the 45 SW installations included in this INRMP, installation missions, and areas surrounding the installations.

3.1 Location and Area

An overview of each installation location is described in this sub-section. **Figure 3-1** depicts the locations of the four Florida installations (CCAFS, PAFB, MTA, and JDMTA) covered by this INRMP. Three of the four installations are located in Brevard County, Florida. JDMTA is located in Martin County, Florida.

3.1.1 CCAFS

CCAFS is located along the Atlantic Coast of Florida in Brevard County. The approximately 16,198 acre CCAFS property is situated on the Canaveral Peninsula, which is a barrier island approximately 155 miles south of Jacksonville, 210 miles north of Miami, and approximately 60 miles east of Orlando. The northern boundary of CCAFS abuts the Kennedy Space Center (KSC) boundary on the barrier island. The southern boundary abuts the city of Port Canaveral. CCAFS is bounded to the east by the Atlantic Ocean and to the west by the Banana River. **Figure 3-2** depicts the location of CCAFS on Florida's Atlantic Coast.

3.1.2 PAFB

PAFB is located on a barrier island on the central eastern coast of Florida in Brevard County. The main base covers approximately 2,002 acres. PAFB is located south of the city of Cocoa Beach and north of Satellite Beach and is approximately 20 miles south of CCAFS. PAFB is bounded by the South Atlantic Avenue/A1A and the Atlantic Ocean to the east and the Banana River on the west. **Figure 3-3** depicts the location of PAFB on Florida's Atlantic Coast.

3.1.3 MTA

MTA is located at 5060 South Minton Road (State Road [SR] 509) in Palm Bay, Florida. MTA is 640 acres in size and consists of the entire 25th Section of Township 28 South, Range 36 East, in Brevard County. The MTA installation is approximately eight miles southwest of Melbourne, 15 miles southwest of PAFB, and 30 miles southwest of CCAFS. **Figure 3-4** depicts the inland location of MTA in east central Florida.

3.1.4 JDMTA

JDMTA is located at 18205 Southeast County Line Road, Tequesta within the inland portion of the Jonathan Dickinson State Park (JDSP), Martin County, Florida. The approximately 11-acre installation is located on Florida's East coast approximately 80 southeast of MTA, 90 miles southeast of PAFB, and approximately 105 miles south of CCAFS. **Figure 3-5** depicts the location of JDMTA.

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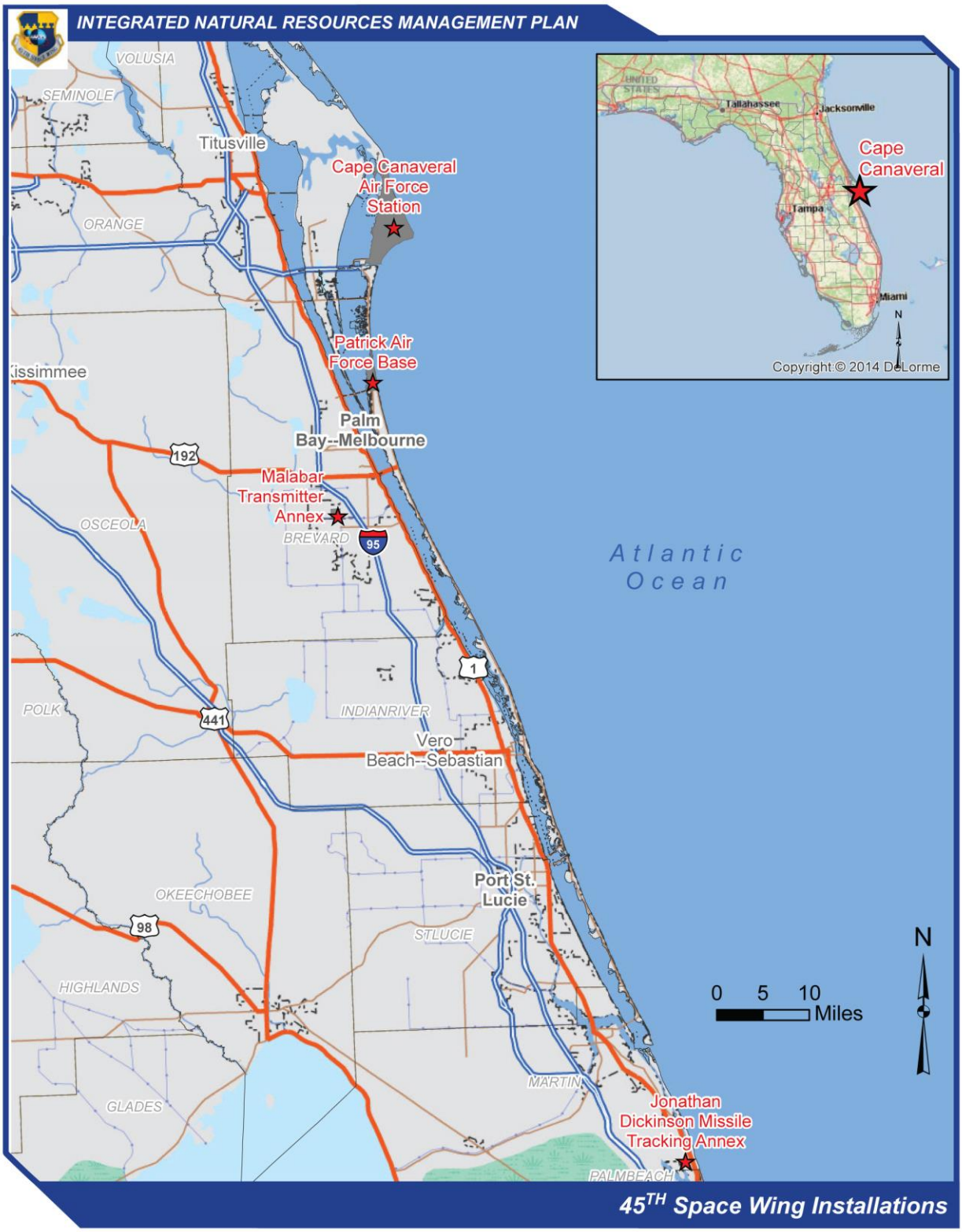

Figure 3-1. 45TH Space Wing Installations

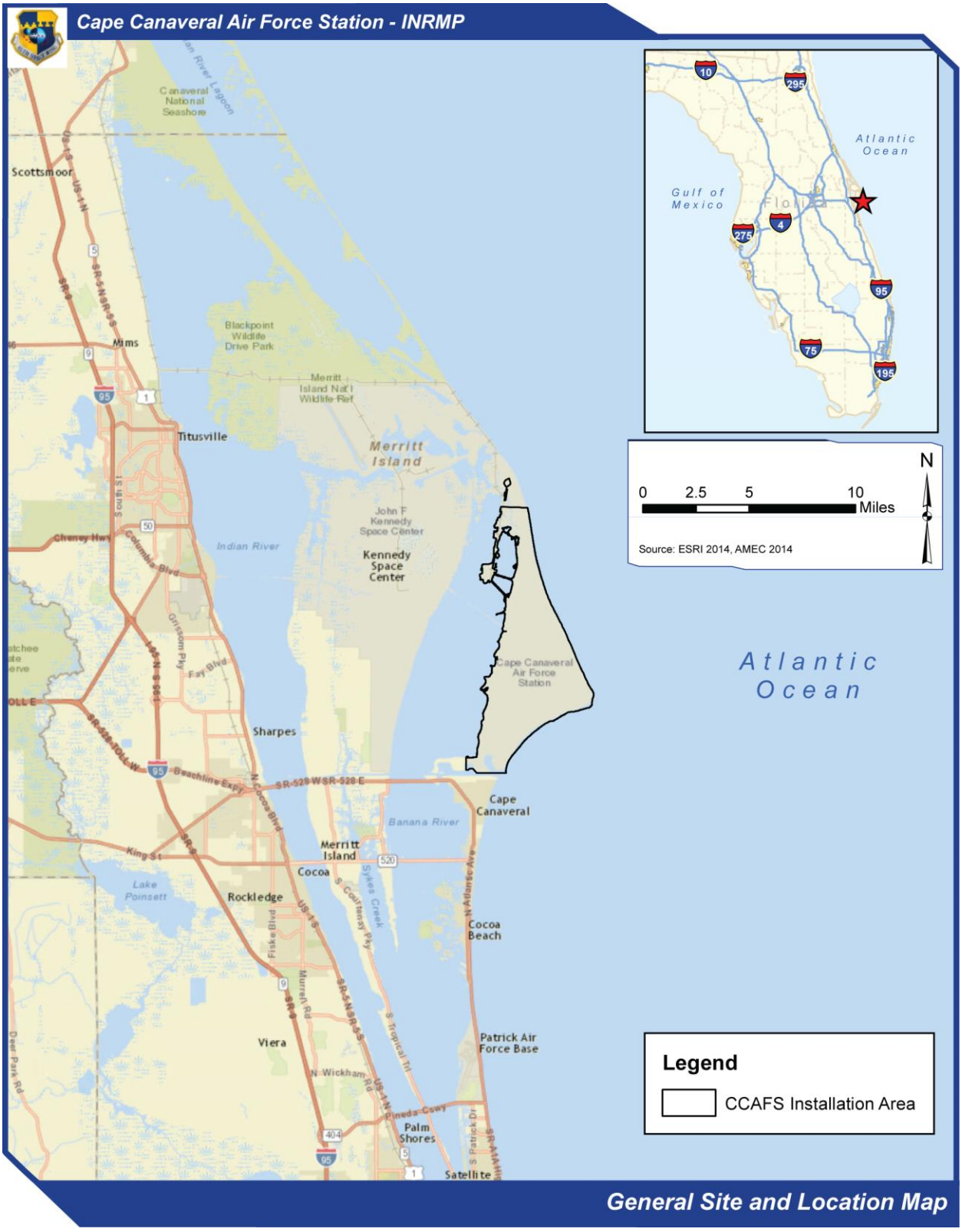

Figure 3-2. CCAFS and Vicinity

Figure 3-3. PAFB and Vicinity

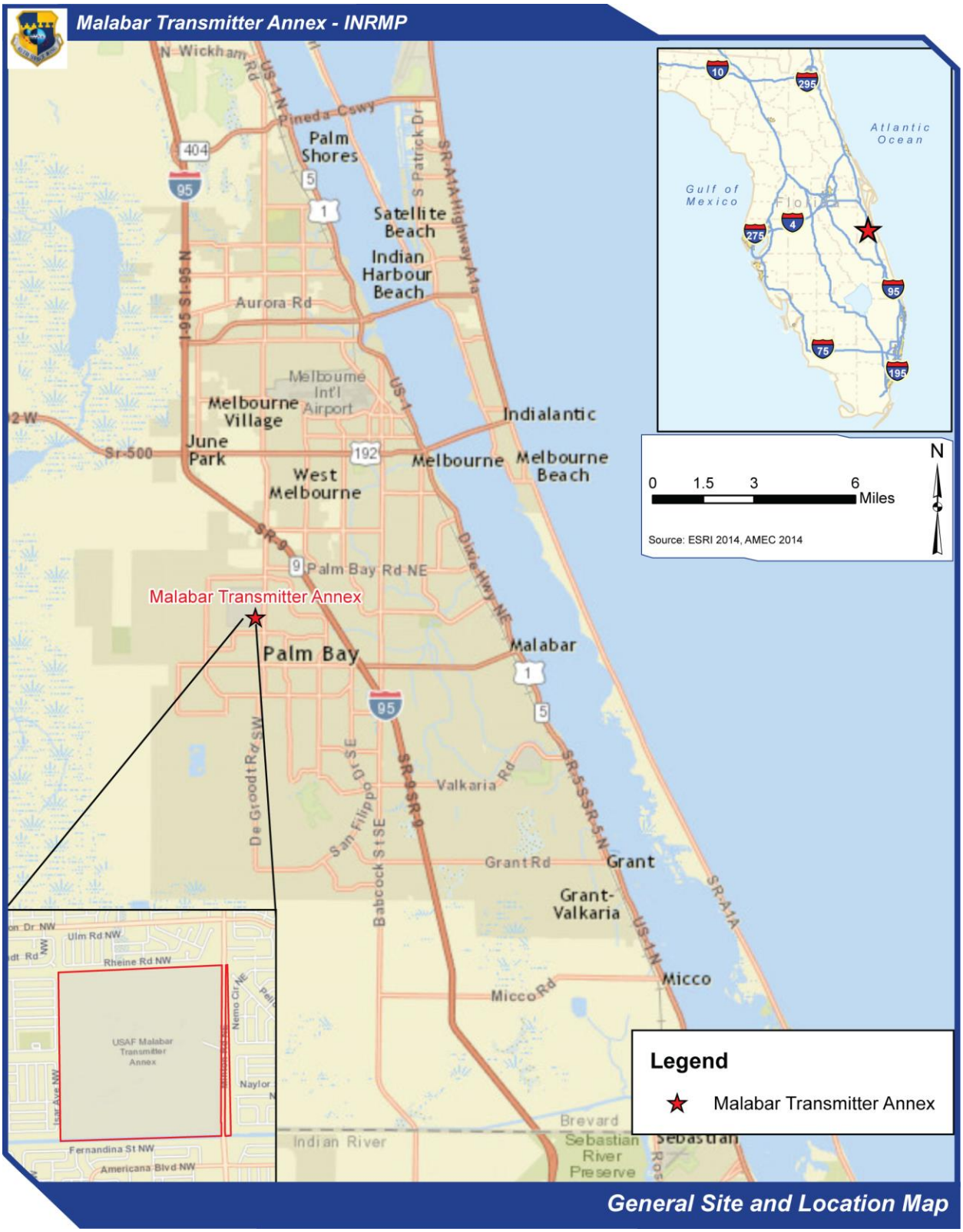

Figure 3-4. MTA and Vicinity

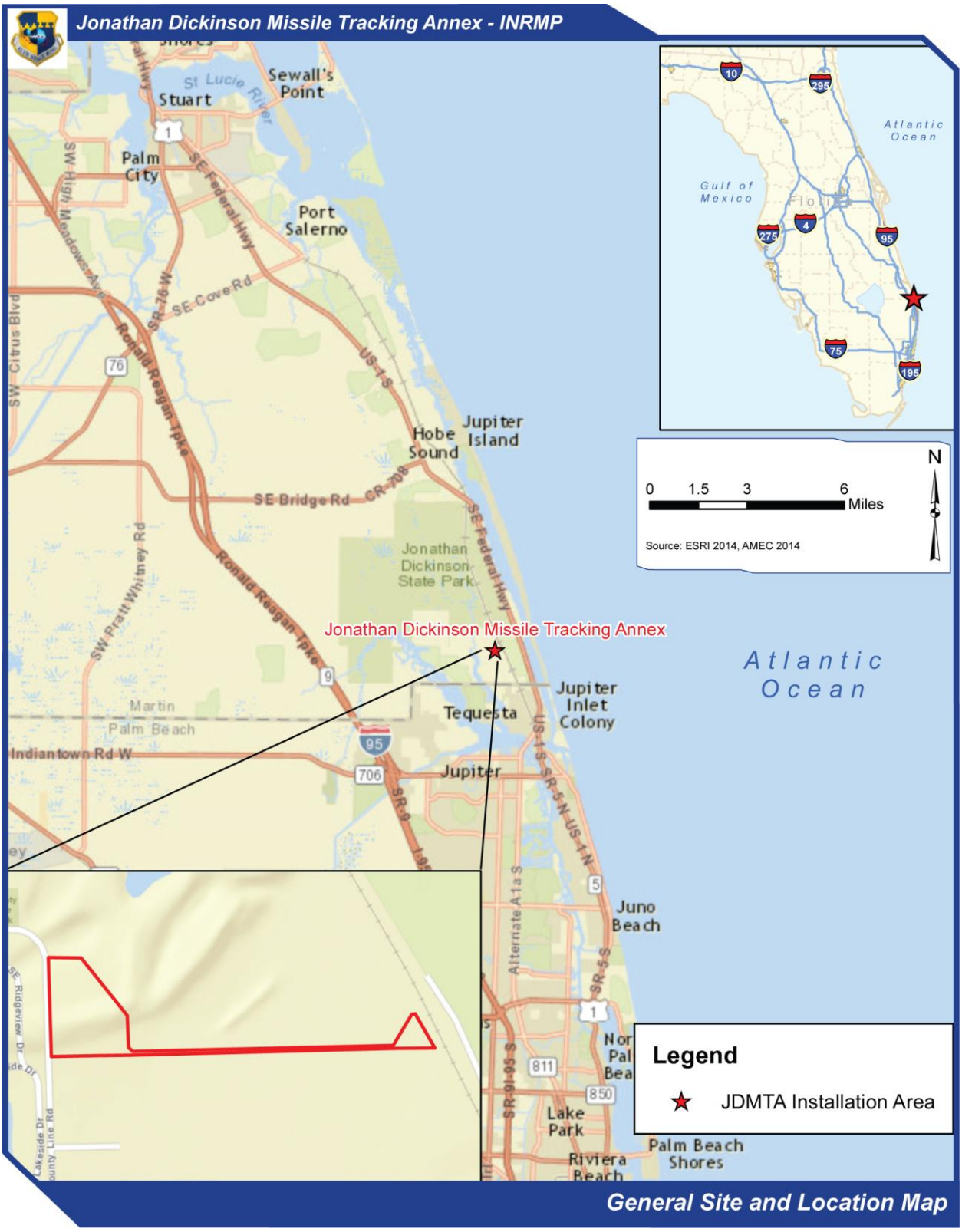

Figure 3-5. JDMTA and Vicinity

3.2 Installation History

3.2.1 CCAFS

The Ais Indians were the primary occupants of the area currently occupied by CCAFS throughout the period when explorers and settlers arrived in Florida (Rouse 1951). Introduced European diseases and raids by rival tribes and settlers lead to the eventual extinction of the Ais tribe (Milanich 1994, 1995; Rouse 1951).

The Canaveral Peninsula remained largely uninhabited until the mid-nineteenth century when a lighthouse was established on the Canaveral Peninsula (Cantley, et al. 1993). By the 1880s, a number of homesteads existed along the Banana River in the current area of CCAFS. These homesteads focused primarily upon growing citrus. After the turn of the century, the focus on citrus production shifted to a wider range of livelihoods suitable to a maritime environment (HPA 1987).

New homesteaders entered the area from 1900 through 1920. This wave of homesteaders settled the interior of the Canaveral Peninsula particularly along the new road improvements established after the 1920s. Some commercial enterprises as well as planned subdivisions were established between 1920 and 1940 (Buchner, et al. 2008; Cantley, et al. 1993; Shofner 1995, 1996). However, the area still retained its isolated nature.

The Federal government's interest in Cape Canaveral increased in the late 1940s when the Federal government began buying land from the state to establish a long-range proving ground. A committee formed by the DoD in 1946 was charged with the task of finding a suitable missile test center. Subsequently, the Long Range Proving Ground on Cape Canaveral was established in 1949 under jurisdiction of the USAF.

The land use at Cape Canaveral has changed over the past 60 years due to USAF development and fire suppression (Oddy et al. 1999). Oddy et al. (1999) noted that studies of the current CCAFS area conducted prior to DoD acquisition and aerial photography from 1943 indicate that CCAFS was an open, shrubby and herbaceous landscape with forests found primarily along the Banana River.

3.2.2 PAFB

The pre-history of PAFB mirrors that of CCAFS. The US Navy established the current PAFB installation in 1940 as the Banana River Naval Air Station. The Naval Air Station served as an active base for anti-submarine sea-patrol planes during World War II. After the installation's deactivation in 1947, it was transferred to the USAF in 1948. In 1950, the installation was reactivated and renamed PAFB in honor of the chief of the US Army Air Service from 1921 to 1927, Major General Mason M. Patrick. At this time the USAF began developing the Eastern Test Range. From 1950 to present, the 45 SW, formerly the Eastern Space and Missile Center (ESMC), has been responsible for launch, test and support operations associated with the cruise missile program, ballistic missiles, the Apollo and Space Shuttle programs, and the Delta, Atlas, Titan programs, and other commercial launch programs (SpaceX, Athena, etc.).

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Land use studies of PAFB prior to DoD acquisition are not existent. However, it is believed that the current site of PAFB was relatively undisturbed. The vegetative composition of the area likely consisted of mangrove forests along the Banana River shoreline and an undisturbed coastal dune area along the Atlantic Ocean (Florida Natural Areas Inventory [FNAI] 2010). The areas between the river and ocean were likely similar to that of CCAFS (open, shrubby and herbaceous landscape). Since DoD acquisition in the 1940s, there have been land use changes from development associated with the establishment of the military installation.

3.2.3 MTA

Historic photos indicate that flatwood forests historically dominated MTA and that much of MTA was clear cut prior to 1960.

The area where MTA is now located was originally used by the US Navy for auxiliary airfield operations during World War II as a satellite airfield for pilot training at what is now the Melbourne International Airport. MTA was subsequently selected by the USAF as the site for the USAF transmitter facility to prevent radio transmissions from interfering with operations at CCAFS. The transmitter and support facilities were built on government property around 1943. When launch support was provided from the MTA property, there were as many as 20 towers located within MTA. The grassy areas now observed within MTA are the former sites of these towers. Although there was virtually no development in this area of Brevard County when the location was selected as a transmitter site, there is currently development, primarily residential, on all sides.

3.2.4 JDMTA

JDMTA is utilized under a Land Lease option executed on 22 December 1978 between the State of Florida and the US Government. Three parcels of land compose JDMTA within the JDSP. These parcels are 8.49 acres, 2.12 acres, and 0.9 acres in size, and are designated as Tracts 100LE-1, 100LE-2, and 100LE-3, respectively. These parcels constitute the main compound, boresight tower, and the land and road connecting the installation and boresight tower. Prior to the establishment of the JDMTA in the early 1980's, the land use in this area was in a natural state compatible with JDSP.

3.3 Military Mission

The Air Force Space Command (AFSPC or Space Command) defines the mission, organization, and responsibilities of the 45 SW. The stated mission of the 45 SW, according to the General Plan (USAF 2013a) is:

One Team ... Delivering Assured Space Launch, Range and Combat Capabilities for the Nation

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The 45 SW is responsible for overseeing the preparation and launching of US Government, civil, and commercial satellites from CCAFS and operates the Eastern Range (ER) for the AFSPC. The 45 SW also provides launch facilities and services to support the National Aeronautics and Space Administration (NASA) and commercial space operations and the US Navy's Naval Ordnance Test Unit (NOTU) for missile tests and submarine operations. These all contribute to Space Command's directive to provide an efficient and cost effective means of executing national security and military policy goals.

PAFB is the center of administrative activities of Headquarters 45 SW, providing support facilities and housing for the 45 SW Mission. The 920th Rescue Wing is the primary user of the PAFB airfield. JDMTA is an active launch support facility and is part of the CCAFS virtual range for launch activities. JDMTA provides radar, telemetry, communications, command, and timing instrumentation data from space vehicle launches at CCAFS and KSC. MTA is used primarily for training events.

3.3.1 Mission Areas

The Mission Areas of the 45 SW (PAFB 2013) are identified as:

- ER Operations
- Launch Operations and Support
- Expeditionary and Contingency Readiness
- Base and People Support

3.3.1.1 Eastern Range Operations

The ER Operations provide the resources and activities for safe flight, range instrumentation, infrastructure, and schedule to support space and ballistic launches. The ER consists of tracking stations at CCAFS, mainland annexes, and down range tracking stations on islands located in the Caribbean Sea and South Atlantic Ocean. The 45 SW is the primary missile and rocket launch organization for the USAF on the East Coast of the US. All launch countdown activities and many government and contractor support operations utilize the ER Operations.

3.3.1.2 Launch Operations and Support

Launch Operations and Support provide a reliable launch infrastructure, launch teams and partnership with launch and satellite programs. The 45 SW personnel provide range safety and weather forecasting services to CCAFS. KSC's helicopter and airplane fleet, along with other visiting NASA aircraft are serviced at 45 SW hangars on PAFB. The Morrell Operations Center (MOC), radar tracking and weather monitoring instruments are located at CCAFS. In addition to USAF launches, the ER also supports NASA, contractors, and foreign government missions.

3.3.1.3 Expeditionary and Contingency Readiness

This mission area provides trained people, equipment, and processes ready to support wartime and contingency operations.

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3.3.1.4 Base and People Support

This mission area provides installation infrastructure, health care services, security, information systems, morale/welfare activities, workforce safety, human resources, financial services, logistics services, and environmental stewardship to support the mission now and in the future.

3.3.2 Tenants and the 45 SW Mission

Tenants are other military, government or commercial organizations not directly associated with the 45 SW that enhance or contribute to the stated Space Command/45 SW mission.

Tenants under the 45 SW stationed at PAFB are:

- 17th Test Squadron, Detachment 3 (17 TS, Det 3);
- 920th Rescue Wing/AFRC:
  - 301st, 39th, and 308th Rescue Squadrons;
- Air Combat Command Program Project Management Squadron/QA (OL-J);
- Air Force Office of Special Investigations (8th Field Investigative Region, Det 802);
- Air Force Technical Applications Center (AFTAC);
- Defense Equal Opportunity Management Institute (DEOMI);
- Department of State/Air Wing;
- Florida Air National Guard, 114th Combat Communications;
- Joint Stars Joint Test Force (JSTARS);
- National Geospatial Intelligence Agency (NGA-ERNST);
- US Army Corps of Engineers (USACE).

The following tenants are directly stationed on or have a major focus of interest on CCAFS:

- 2nd Space Operations Squadron (2 Standard Operating Procedure [SOPs], Det 1, 2);
- 605th Test & Evaluations Squadron, Detachment 2 (Det 2, 605TS);
- Customs and Border Protection – Homeland Security;
- Military Surface Deployment and Distribution (832nd Transportation Brigade);
- NASA;
- National Reconnaissance Office (NRO);
- NOTU;
- US Coast Guard (USCG);
- US Navy – Military Sealift Command.

The following tenant contractor organizations also support the 45 SW:

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- Aerospace Fuels Laboratory;
- Boeing;
- Civil Air Patrol, Florida Wing;
- Lockheed Martin Astronautics;
- Space Coast Launch Services (SCLS) for Launch Operations Support;
- Space and Missile Systems Center;
- Space Florida;
- SpaceX;
- United Launch Alliance.

3.4 Surrounding Communities

Brevard County has experience a slight growth of approximately three percent in population between 2005 and 2013. The City of Palm Bay, where MTA is located, has experienced the highest population increase, with 11 percent growth since 2005. **Table 3-1** provides historical (2005) and current (2013) population data for Brevard County and its municipalities.

Table 3-1. Population Growth for Brevard County and Municipalities from 2005 to 2013

County/Municipality	2005 Population	2013 Population (a)
Brevard County	530,452	548,424
Cape Canaveral	10,034	9,987
Cocoa Beach	12,880	11,214
Melbourne	75,060	77,394
Palm Bay	91,888	103,190
Satellite Beach	11,205	10,109
Brevard-Unincorporated	208,825	213,430

Source: University of Florida (UF) 2013
(a) Population numbers finalized on 15 October 2014

3.4.1 CCAFS

The installation is bordered to the east by the Atlantic Ocean and to the West by the Indian River Lagoon (IRL) (**Figure 3-2**). These water bodies serve as natural buffers to the installation and the Atlantic waters facilitate the launch of space launch vehicles. To the north of CCAFS are the KSC and then Merritt Island National Wildlife Refuge (MINWR). Potential encroachment impacts along the KSC border are inconsequential due to the similar nature of the operations conducted at CCAFS and KSC. The southern border of CCAFS abuts Port Canaveral (Port), a growing commercial and active tourist port. The Canaveral Port Authority (CPA) operates the Port and relies on revenues from the successful businesses it has developed: cruises, cargo, land leases and park operations (CPA 2014). Port Canaveral has the potential to impact

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operations at CCAFS. Increased marine traffic in the waters of the Port is also a security concern for CCAFS. Security personnel regularly patrol the Port waters to ensure unauthorized personnel do not access CCAFS via the Port. There is also concern regarding the increase in human traffic and the associated impacts to safety and access. Recent transportation infrastructure improvements to SR A1A, SR 528 and SR 401 have improved traffic flow in and around the Port. Tourists using the port facilities do not access CCAFS.

CCAFS is located in close proximity to several municipalities in Brevard County, including Titusville to the northwest, Cape Canaveral and Cocoa Beach to the south; Cape Canaveral is the nearest municipality. The unincorporated area of Merritt Island is also located proximate to, and west of, CCAFS. Land use adjacent to CCAFS is primarily open water and commercial.

3.4.2 PAFB

PAFB is located on both sides of Highway A1A between Cocoa Beach and Satellite Beach; it is bordered to the north and south by unincorporated portions of Brevard County. The primary land use of these unincorporated areas adjacent to PAFB is urban. Similar to CCAFS, PAFB is bordered to the east by the Atlantic Ocean and to the west by the IRL. These water bodies serve as natural buffers to the installation.

PAFB has little vacant land due to its position in the landscape located on a slender barrier island. There is no vacant land adjacent to the northern and southern boundaries of the installation. The surrounding communities have expressed concern over aircraft noise despite language written into their deeds noting the base's military mission.

Other municipalities located near PAFB include Melbourne, Indialantic, and Melbourne Beach. With the exception of the City of Melbourne, the population in these municipalities has decreased since 2005 (**Table 3-1**).

3.4.3 MTA

MTA is located within the city limits of Palm Bay, Florida. Palm Bay is the most populous city within Brevard County with a current population estimated at 103,190. Forbes ranked Palm Bay as "America's 15th Fastest-Growing City in 2014" and in 2010 was listed as "Most Innovative City" and "Best Bang for the Buck" (City of Palm Bay 2014). The Palm Bay population has been growing for the past 30 years (City of Palm Bay 2014), and as a result of this population increase land use surrounding MTA has changed significantly from when it was first established back in the 1940's. MTA is immediately bounded by residential development to the west and north of the installation; by a road (Minton Road) and canal (Tillman Canal) to the east and south, respectively; but beyond the road and canal are dense residential areas to the east and south.

Encroachment from the surrounding residential areas is a serious safety and security concern for operations within MTA. Existing USAF fence lines are located inside of the MTA boundary line, and some residents are using the USAF land that directly abuts the installation fence. Due to the population increase and surrounding land use, the 45 SW is required to notify adjacent residents prior to substantial training operations and controlled burns. Adjacent residents have

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expressed disapproval of noise and smoke due to military training and prescribed burn operations.

3.4.4 JDMTA

JDMTA is located at 18205 Southeast County Line Road, Tequesta, in the southern area of Martin County near Florida's east coast. The JDSP surrounds JDMTA on three sides (north, east, and south); a residential area bounds JDMTA to the west. The majority of land surrounding JDMTA is used for conservation and recreation. Beyond JDSP, the primary land use is residential. Due to the location of the installation and nature of the JDMTA operations, the size of JDMTA is not likely to expand. Nearby towns to JDMTA include Hobe Sound to the north and Tequesta to the south.

3.5 Local and Regional Natural Areas

3.5.1 CCAFS

Natural areas in the vicinity of CCAFS include the 140,000 acre MINWR, the Canaveral National Sea Shore and Jetty Park in Cape Canaveral. CCAFS, MINWR and the Canaveral National Seashore, all of which are federally owned, represent the largest contiguous stretch of undeveloped land along Florida's Atlantic coast and contain significant biological and cultural resources.

Figure 3-6 depicts lands identified by the Florida Natural Areas Inventory (FNAI) that have natural resource value and are being managed at least partially for conservation. This figure encompasses areas along the Atlantic coast, IRL and St. Johns River and highlights the large amount of lands managed for conservation in proximity to CCAFS, PAFB, and MTA.

3.5.2 PAFB

The Archie Carr National Wildlife Refuge is located to the south of PAFB, and federally owned lands (CCAFS, KSC, and Canaveral National Seashore) are located to the north. These natural areas are in the vicinity of PAFB; however, these natural areas are greater than 10 miles from PAFB.

3.5.3 MTA

Several undeveloped, natural areas are located near MTA. The Malabar Scrub Sanctuary, established by the Brevard County Environmental Endangered Lands Program, is approximately seven miles to the east of MTA. The 130-acre Turkey Creek Sanctuary is located approximately four miles to the east of MTA. Two smaller city parks, Dewar Park and Ais Trail Park, are located about five miles northeast of MTA. **Figure 3-6** depicts lands near MTA that have natural resource value.

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3.5.4 JDMTA

The JDSP borders three sides of JDMTA. A variety of natural communities are present in the 11,383-acre JDSP. **Figure 3-7** depicts lands identified by the FNAI that have natural resource value and are being managed at least partially for conservation near JDMTA.

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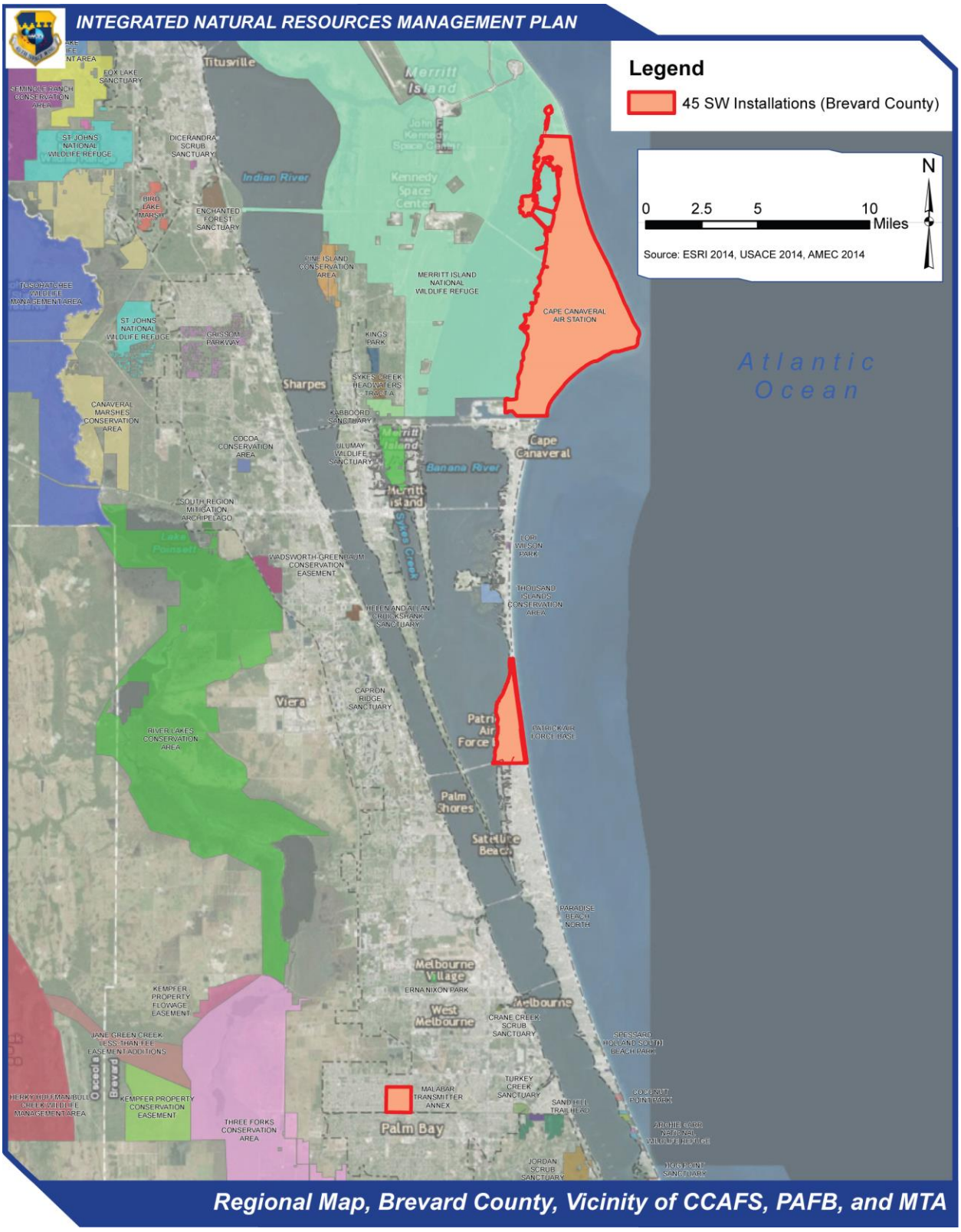

Figure 3-6. Regional Map, Brevard County: CCAFS, PAFB, and MTA

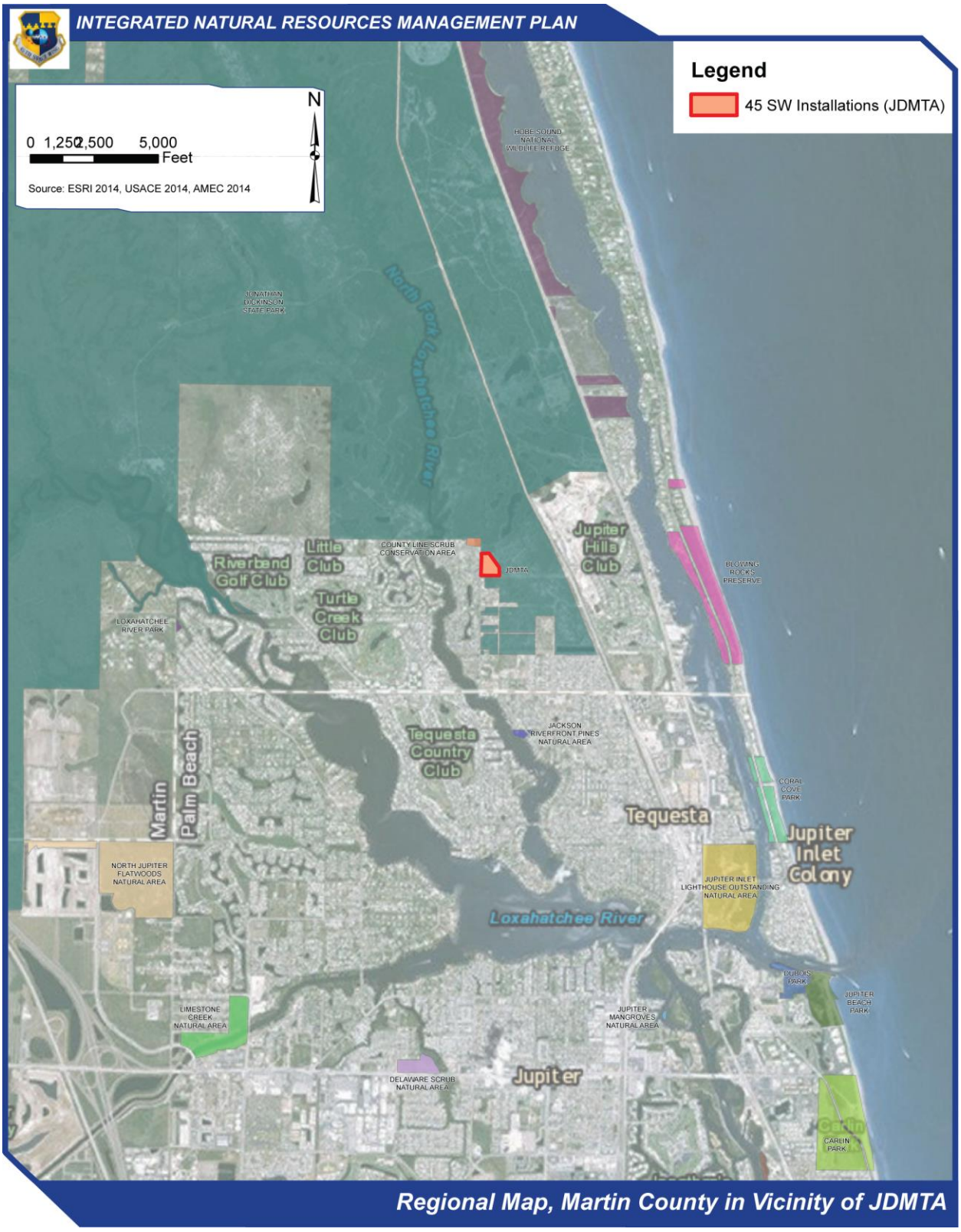

Figure 3-7. Regional Map, Martin County in vicinity of JDMTA

Chapter 4. Physical Environment

4.1 Climate

4.1.1 Florida Climate

The climate of the north and central parts of Florida is humid subtropical, while south Florida is characterized by a more tropical climate. During the summer, the prevailing winds are low to moderate from the southeast and southwest producing small waves along the majority of the Florida peninsula, and larger waves along the panhandle coast. During the winter months, massive cold fronts from the north pass through Florida. As the front approaches Florida, the wind speed increases and is from the southwest. However, once the front passes over the Atlantic Coast or the Gulf of Mexico, the wind direction reverses and is strongest out of the north and northeast. As a result the winter cold fronts have little effect on the panhandle coast of Florida, but are a substantial weather factor for the west and east coasts of the Florida peninsula (Randazzo and Jones 1997).

On average, Florida receives approximately 55 inches of precipitation annually, with rain falling approximately 10 percent of days during a typical year. The driest areas of Florida are the Florida Keys and the offshore bar of Cape Canaveral. The panhandle and southeastern Florida have the highest precipitation in the state. The Azores-Bermuda High Pressure system exerts a powerful influence on peninsular Florida's weather during the winter. Within this high pressure system air is subsiding and creating conditions in which precipitation cannot occur. However, as the water around the state warms in the spring, the high pressure system over Florida weakens and the summer rains begin. Summer precipitation generally falls from local thunderstorms, or from long squall lines created when hot humid air from the Atlantic Ocean converges with equally hot and humid air from the Gulf of Mexico. In the summer, typically, thunder clouds will form during the morning, and brief but heavy rainfall occurs in the afternoon. The majority of summer rain in Florida occurs during daylight hours as summer rain is dependent upon air being heated by the ground surface (Winsberg 2014).

El Niño and La Niña conditions are among the strongest drivers of the climate of North America, shifting the position of jet streams across the continent. Florida experiences particularly strong long-term weather shifts as a result of El Niño and La Niña conditions. El Niño conditions typically brings 30 to 40 percent more rainfall and cooler temperatures to Florida in the winter, while La Niña conditions brings a warmer and much drier than normal winter and spring (Winsberg 2014).

4.1.2 45th Space Wing (45 SW) Climate

Long, relatively humid summers and mild winters characterize the climate at the 45 SW installations located in Brevard and Martin counties, Florida. Summer and winter temperatures in this region are moderated by the waters of the IRL system and the Atlantic Ocean (Winsberg 2014). Maximum temperatures during the summer show little day-to-day variation; however, minimum temperatures during the winter may vary considerably from day-to-day. Prevailing winds are generally from the north and east, except in March, when winds prevail from the south.

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Rainfall is heaviest in the summer and fall months, between June and October, during which time approximately 60 percent of the rainfall occurs (Southeast Regional Climate Center [SERCC] 2014). Most rainfall in summer occurs as afternoon and evening showers and thunderstorms. Daylong rains in summer are rare, but two to three inches may fall within one or two hours. Rainfall in excess of eight inches during a 24-hour period will occur on average once every 25 years. This activity is generally associated with a tropical storm or hurricane (Hucklf et al. 1974).

All 45 SW installations are vulnerable to tropical storms, including hurricanes and the associated storm tides and surges, which can occur between early June and mid-November. Historic data show that the storm tide height for a Category 5 (strongest) hurricane could reach 15 feet, inundating most of CCAFS and PAFB. The high winds associated with hurricanes necessitate adherence to special construction codes, established to reduce wind load-damage to structures.

Table 4-1 and **Table 4-2** provide average monthly climate data (temperature and rainfall) for Brevard and Martin counties, Florida.

Table 4-1. Average Temperature and Rainfall for Brevard County, Florida (FL) (1981-2010)

Month	Average Temperature (°F)			Average Rainfall (inches)
	Maximum	Minimum	Average	
January	69.9	49.9	59.9	2.75
February	72.3	53.1	62.7	2.83
March	76.6	57.4	67.0	3.92
April	80.7	61.6	71.2	2.77
May	86.0	68.5	77.2	3.05
June	89.7	73.0	81.4	6.60
July	91.6	74.3	82.9	6.90
August	91.3	74.6	82.9	7.88
September	88.6	73.8	81.2	7.07
October	84.0	68.4	76.2	4.72
November	78.0	60.6	69.3	2.94
December	72.2	53.6	62.9	2.56
Annual Average	**81.7**	**64.1**	**72.9**	**54.0**

Notes: Climate normals recorded at National Climate Data Center (NCDC) Station 088942, located in Titusville, Florida.
Source: SERCC 2014

Table 4-2. Average Temperature and Rainfall for Martin County, FL (1981-2010) (page 1 of 2)

Month	Average Temperature (°F)			Average Rainfall (inches)
	Maximum	Minimum	Average	
January	71.8	51.3	61.6	2.37
February	73.7	54.0	63.8	2.90
March	76.7	57.7	67.2	4.47
April	80.2	61.1	70.7	2.74
May	84.4	67.3	75.9	3.55
June	87.8	72.1	79.9	7.07
July	89.4	73.6	81.5	6.58
August	89.1	73.7	81.4	7.54

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Table 4-2. Average Temperature and Rainfall for Martin County, FL (1981-2010) (page 2 of 2)

Month	Average Temperature (°F)			Average Rainfall (inches)
	Maximum	Minimum	Average	
September	87.6	73.2	80.4	7.62
October	83.8	68.2	76.0	5.87
November	78.5	61.2	69.8	3.78
December	73.7	54.9	64.3	2.37
Annual Average	**81.4**	**64.0**	**72.7**	**56.9**

Notes: Climate normals recorded at NCDC Station 089219, Vero Beach 4 W, Florida.
Source: SERCC 2014.

4.1.3 Climate Change

In order to assess the potential impacts from climate change on the natural resources at a given facility, the first step is to identify what the projected range of change might be in the future both mid- and long-term. The second step is to identify which species or systems are most likely to be affected by the projected range of changes. Climate change vulnerability assessments are part of this process. Finally, the third step is to identify management activities and projects now and in the future that can respond to these challenges. Species or systems likely to be affected at 45 SW installations and appropriate management priorities, activities and projects are identified in the respective management sections in **Chapter 7**.

Due to the lack of readily available regionally-specific model outputs, the Nature Conservancy's ClimateWizard was used to determine likely future climate regimes under different emissions scenarios. ClimateWizard enables technical and non-technical audiences alike to access leading climate change information and visualize the regional impacts to both temperature and precipitation that are likely to occur in areas within the US. In general, Florida's climate will grow considerably warmer, but rainfall predictions vary from considerable increases, small increases to considerable decreases. The ensemble average of 16 models predict an average 3.1°F (range: 2 to 5 °F) increase in average temperature and a -6 inch (range: -26 to 13 inches) decrease in annual precipitation by 2050 under a moderate emissions scenario as summarized on The Nature Conservancy's Climate Wizard site (http://www.climatewizard.org) (**Figure 4-1**). **Table 4-3** presents a summary of the predictions for each model.

Table 4-3. Summary of Results from Climate Change Models Predicted Values for Brevard County, Florida by Mid-Century Under Different Emissions Scenarios (page 1 of 2)

Climate Model	Annual Precipitation (inches)			Average Temperature (°F)		
	B1	A1B	A2	B1	A1B	A2
bccr_bcm2_0.1	-3.43	-6.18	-2.17	2.99	3.47	3.62
cccma_cgcm3_1.1	-0.80	2.14	3.97	2.86	3.54	3.65
cnrm_cm3.1	-1.50	-1.97	-5.63	2.76	3.90	4.17
csiro_mk3_0.1	-1.81	-0.71	2.28	1.65	1.86	2.77
gfdl_cm2_0.1	13.13	2.34	2.25	2.46	4.07	3.58
gfdl_cm2_1.1	7.26	-6.69	0.49	2.48	4.59	3.89
giss_model_e_r.1	-1.84	-0.38	1.95	1.87	2.74	3.07
inmcm3_0.1	-0.19	7.10	3.05	2.52	3.79	3.21
ipsl_cm4.1	-2.27	-0.10	0.90	2.78	3.79	3.21

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Table 4-3. Summary of Results from Climate Change Models Predicted Values for Brevard County, Florida by Mid-Century Under Different Emissions Scenarios (page 2 of 2)

Climate Model	Annual Precipitation (inches)			Average Temperature (ºF)		
	B1	A1B	A2	B1	A1B	A2
miroc3_2_medres.1	-9.83	-21.46	-25.70	3.29	4.85	4.58
miub_echo_g.1	0.08	4.06	3.15	2.71	3.49	3.71
mpi_echam5.1	10.78	13.28	11.06	2.64	3.68	3.14
mri_cgcm2_3_2a.1	4.85	4.93	3.98	2.41	3.20	2.69
ncar_ccsm3_0.1	0.59	1.53	-1.66	2.65	3.30	3.65
ncar_pcm1.1	2.55	4.36	4.68	1.43	2.12	2.24
ukmo_hadcm3.1	8.65	13.42	3.66	3.08	4.29	3.28
Ensemble Average	-6.18			3.14		

From http://www.climatewizard.org

Emissions Scenarios: B1 = low, A1B = medium, A2 = high

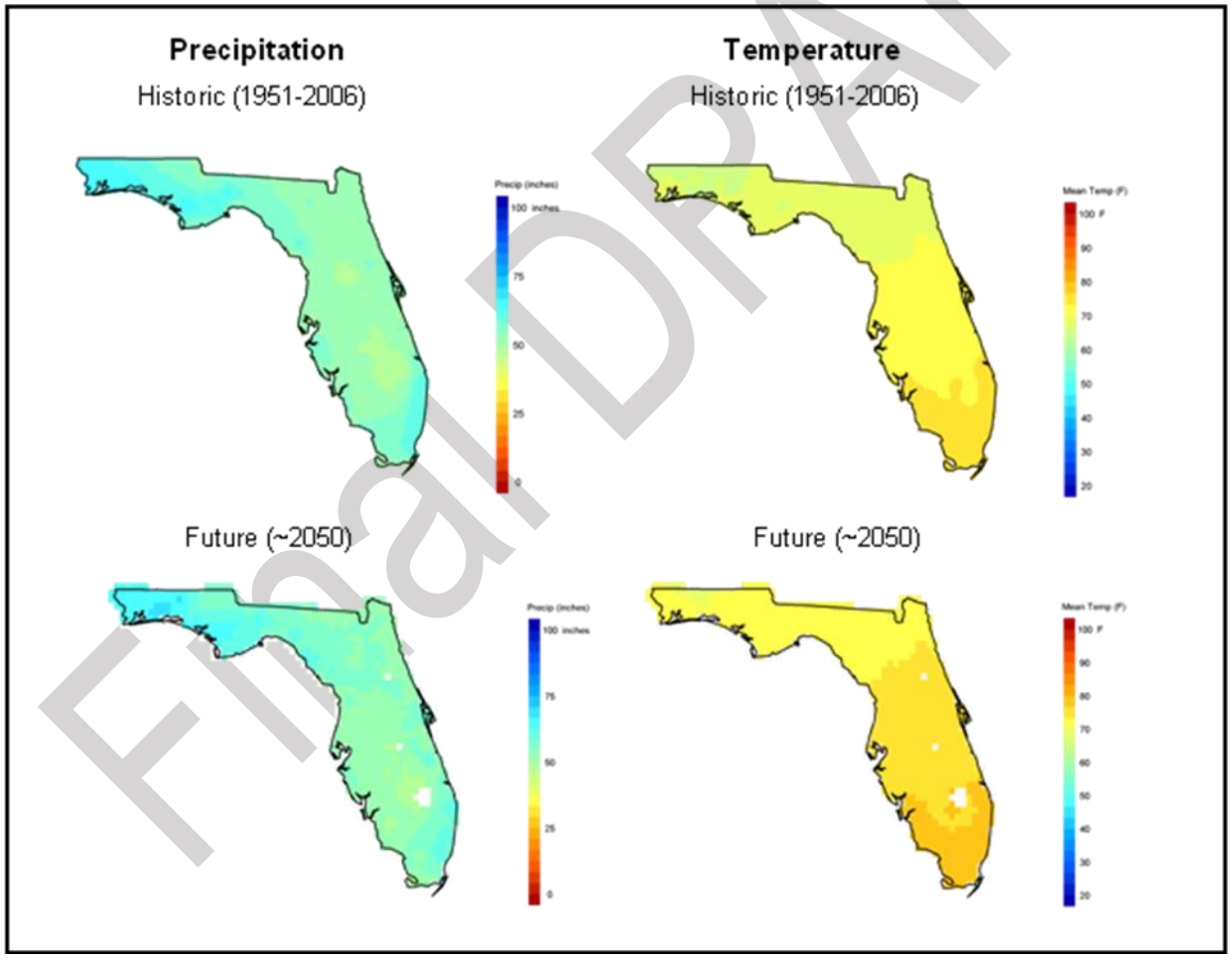

Figure 4-1. Historic and Projected Annual Precipitation and Average Temperature for Florida based on an Ensemble Average for Medium Emissions Scenarios

(http://www.climatewizard.org)

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Changes that have already been observed in Florida include retreating and eroding shorelines, dying coral reefs, salt water intrusion into the freshwater aquifer, increasing numbers of forest fires, and warmer air and sea surface temperatures (Natural Resources Defense Council [NRDC] 2001). In coming years, these effects may become more common, and increasingly severe. Projected global warming will raise Florida's average temperature by between 4 and 10 °F over the next 100 years (NRDC 2001). The summer heat index increase of 8 to 15 °F will be the most dramatic in the nation (NRDC 2001). Major consequences include significant increases in the number of hot days (95 °F or above) and decreases in freezing events (US Global Change Research Center 2014). Climate change is expected to increase harmful blooms of algae and several disease-causing agents in inland and coastal waters (US Global Change Research Center 2014). The number of Category 4 and 5 hurricanes in the North Atlantic and the amount of rain falling in very heavy precipitation events have increased over recent decades, and further increases are projected (US Global Change Research Center 2014). Rainfall is anticipated to become more intense but also more sporadic, causing worse droughts and storms (NRDC 2001).

Over the last century, the sea level has risen 8.5 inches (Florida Climate Center at http://climatecenter.fsu.edu/topics/climate-change). Recent predictions for sea level rise in Florida are approximately 2.5 – 3 feet by 2100 (Mitchum 2011). The coastal mangrove-forested islands throughout southern Florida may disappear because of their incompatibility with accelerated sea-level rise (Flight Operations Control Center [FOCC] 2010a). More than half of the salt marsh, shoals, and mudflats critical to birds and fishes foraging in Florida estuaries could be lost during the 21st century (FOCC 2010b). Beaches erode 100 to 200 feet with every 1 foot rise in sea level. With a 50 percent chance of the sea level rising 4 feet by 2200, the beaches could erode 200 to 800 feet (McCue 2010). A rapid rise of 3-4 feet will diminish the protection that the seaward barrier islands provide to our coastal wetlands within lagoons and estuaries (FOCC 2010a).

Climate change poses a unique threat to sea turtles, since the temperature at which the egg incubates determines the sex of the turtle. As global temperatures continue to rise, sea turtles could be faced with the reality of only females being born in clutches that are laid in sand with temperatures over 88.6 degrees Fahrenheit (Defenders of Wildlife 2010). Sea level rise and storm surge could also destroy sea turtle nesting sites (Defenders of Wildlife 2010). Like manatees, sea turtles also suffer in red tide events. Strandings of sea turtles increase during red tides; investigations have revealed that dead turtles show elevated levels of brevetoxin and live turtles display symptoms of brevetoxin poisoning (Defenders of Wildlife 2010).

In Florida, sea grass communities are reorganizing their distributions as a result of tracking changes in freshwater availability (Herbert et al. 2011). The distribution of mangroves ebbs north and south along the Florida Peninsula determined by freeze cycles (Stevens et al. 2006). However, if climate change causes winter freezes to become less common these native trees and their associated species may be able to move north replacing salt marsh on a more permanent basis (Stevens et al. 2006).

Non-native, invasive species can cause widespread damage to Florida's native biodiversity through direct competition, spreading of disease, hybridization, predation, and other

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mechanisms (Devitt et al. 2012). Warming air and water temperatures projected under climate change are expected to increase successful species invasions and subsequent spread (Walther et al. 2009). There are concerns about the expanding and expensive problem of invasive, non-native plant species in Florida. The Brazilian peppertree (*Schinus terebinthifolius*) is an invasive upland species that is prevalent across the state and on the 45 SW installations. Old world climbing fern (*Lygodium microphyllum*) is another non-native, invasive species whose range is expanding along Florida's north-moving frost line (Knight et al. 2011).

Overall with the likely increase in rainfall and temperature, the resources most likely to be impacted by climate change are special status species, invasive species, vegetation and wildland fire management. For more detailed analysis associated with those resources, see **Chapter 7**.

4.2 Landforms

Topography or landforms can be defined as natural features of a land surface, and can include such large features as plains, plateaus, mountains, and valleys, as well as smaller features such as hills, eskers, and canyons. Florida is part of the Atlantic Coastal Plain (US Geological Survey [USGS] 2003), but the peninsula of Florida has been repeatedly covered by seawater and then re-exposed over millions of years, allowing the formation of subtle landforms when compared to other areas of the Atlantic–Gulf Coastal Plain (eastern coast of the US). Landforms along the eastern coast of Florida may include dunes, saline marshes, mangroves swamps, sandy beaches, coral reefs, barrier islands, and sandbars (World Atlas 2014).

4.2.1 CCAFS

CCAFS is located on a barrier island on the eastern coast of Florida and has topography characterized by a series of relic dune ridges. These ridges reflect the gradual beach deposits that have occurred throughout geologic time (Chaki 1974). New beach deposits were laid down in southerly and easterly directions, resulting in a series of abandoned beach ridges to the north of each newly formed ridge. The land surface is level to gently sloping with elevations that range from sea level to 20 feet above mean sea level (msl).

4.2.2 PAFB

PAFB, like CCAFS to the north, is located on a barrier island. Barrier islands are linear islands of sand that parallel many gently sloping coastlines around the world (Johnson and Barbour 1990). There is little topographic relief across PAFB, with elevations ranging from 0 to 20 feet above msl, and the highest elevation corresponding to sand dunes along the Atlantic Ocean (Berger, Louis, and Associates, Inc. 1993).

4.2.3 MTA

MTA is located in the Atlantic Coastal Ridge physiographic subdivision (Miller 1978). MTA is part of a relic beach and dune system. In the undisturbed areas of MTA, the terrain is gently rolling, with alternating low ridges and shallow swales. There is some topographic relief across MTA, with elevations ranging from 18 to 23 feet above msl.

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4.2.4 JDMTA

Similar to MTA, JDMTA is also located in the Atlantic Coastal Ridge physiographic subdivision of Florida (Miller 1978). JDMTA exhibits sand dunes that formed along ancient shorelines. These excessively well-drained relict dunes are the natural sites of the sand pine scrub and xeric oak/scrubby ecosystems. There is some topographic relief across JDMTA, with elevations ranging from 9 to 25 feet above msl.

4.3 Geology and Soils

4.3.1 Geology

The eastern coast of Florida is characterized by Holocene quartz-sand barrier islands, which are relict beach ridges that were formed by the action of waves and wind of the Atlantic Ocean. Further inland areas occur within the Atlantic Coastal Ridge physiographic subdivision, which was formed by a geologic shoreline feature estimated to have formed up to 140,000 years ago when sea level was as much as 30 feet above the present level (Lichtler 1960).

The 45 SW installations in Brevard County are located within the East-Coast Barrier System (Randazzo and Jones 1997). Cape Canaveral, which is mapped as Holocene in age, is a geologically recent barrier island complex and was formed after sea levels rose when the Wisconsinan glaciers retreated (Davis 1997). Brooks (1972) suggested that the formation of the Cape Canaveral peninsula began approximately 7,000 years ago. Cape Canaveral, which is the approximate center of the East Coast Barrier System (Randazzo and Jones 1997), is considered a cuspate foreland, a triangular area of coastal deposition, dominated by many shingle ridges, and often terminating on the landward side into poorly drained terrain. Due to the presence of this cuspate foreland, Cape Canaveral influences the sedimentation and shoreline patterns of approximately 75 miles of Florida's coast to the south of Cape Canaveral (Randazzo and Jones 1997).

Beach ridge and dune areas of Brevard County are of the Pleistocene/Holocene age and covered by undifferentiated quaternary sediments; much of Florida's surface is covered by a varying thickness of undifferentiated sediments consisting of siliciclastics, organics, and freshwater carbonates (USGS 2014). Bedrock in this region ranges from hard to dense limestone. This limestone bedrock is a principal part of one of the major Florida Artesian Aquifers, located 75 to 300 feet below the surface (see **Section 4.4.1**). It is overlaid by sandy limestone, calcareous clay with fragments of shells, coquinold limestone and unconsolidated and well-graded quartz sand.

The MTA and JDMTA installations are located further inland within the Atlantic Coastal Ridge physiographic subdivision, an area with mature dune-like topography and parallel north-south ridges with intervening swales (Hucklf et al. 1974). The Atlantic Coastal Ridge is underlain by the Anastasia Formation from St. Johns County southward to Palm Beach County. The Anastasia Formation generally is recognized near the coast but extends inland as much as 20 miles in St. Lucie and Martin counties (USGS 2014). Three major geologic units underlie Martin County. The upper unit (about 700 feet below the land surface) is sand, silt, clay, and limestone. Beneath the upper unit (to a depth of about 13,000 feet) is a Section of sedimentary rocks,

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mostly limestone and dolomite. Dense igneous and metamorphic rocks are found at depths greater than 13,000 feet below land surface (Miller 1978).

4.3.2 Soils of the 45 SW

The most prominent soil associations within the Brevard County installations (CCAFS, PAFB, and MTA) include the Canaveral-Anclote complex. This association is composed of nearly level and gently sloping ridges interspersed with narrow wet sloughs that generally parallel the ridges, and includes areas of broad floodplains. This ridge and slough landscape element occurs along the coast near the Atlantic Ocean (Hucklf et al. 1974).

The parent material of the majority of soils in Brevard County is unconsolidated marine sediments of the Pleistocene and recent geological ages. This material is generally very resistant to weathering. Below this layer are the stratified beds of sandy clay loam, fine sand, shell fragments, and marly sandy clay loam that were deposited during the Pliocene age. Topography has affected soil formation, mainly through soil-water relationships.

The major soils along the east-coast barrier system of Florida are moderately well drained to excessively drained, and sandy throughout. The soils are exceptionally dry, even though the water table is often near the surface during rainy periods. The soils are very poor for farming, with only a few local areas supporting citrus groves (Hucklf et al. 1974). These soil conditions do not pose a significant constraint to the development of light industry or roads and streets. Limitations are also slight to moderate for septic tank absorption fields. However, the existence of septic tank absorption fields does have the potential to contaminate the groundwater (Hucklf et al. 1974).

In Martin County, in the vicinity of JDMTA, the most prominent soils are of the Paola-St. Lucie complex. As previously described, JDMTA is positioned on the Atlantic Coastal Ridge, where soils are deep, excessively drained sand and have highly variable slopes. Slopes are particularly complex around JDMTA (McCollum and Cruz 1981).

4.3.2.1 CCAFS

Table 4-4 identifies the mapped soil types and corresponding acreage found within CCAFS, and **Figure 4-2** illustrates the soil types and locations found at CCAFS.

Table 4-4. Major Soil Type Descriptions for CCAFS (page 1 of 2)

Soil Type	Acres	Slope	Description
Canaveral-Anclote complex, gently undulating	7,757	0-5%	Somewhat poorly drained soil, with a water table that is 12 to 36 inches below ground surface. This soil is highly susceptible to wind erosion.
Canaveral-Urban complex	1,795	0-2%	Moderately well drained soil, with a water table that is 30 to 60 inches below ground surface. This soil is highly susceptible to wind erosion.

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Table 4-4. Major Soil Type Descriptions for CCAFS (page 2 of 2)

Soil Type	Acres	Slope	Description
Welaka sand	1,575	0-2%	Excessively drained soil, with a water table that is more than 80 inches below ground surface. This soil is highly susceptible to wind erosion.
Palm Beach sand	1,462	0-5%	Excessively drained soil, with a water table that is more than 80 inches below ground surface. This soil is highly susceptible to wind erosion.
Urban land	1,443	--	--
Turnbull and Riomar soils, tidal	618	0-1%	Very poorly drained soil, with a water table more than 80 inches below ground surface. This soil is not susceptible to wind erosion
Quartzipsamments, smoothed	504	0-5%	Moderately well drained soil, with a water table that is 24 to 60 inches below ground surface. This soil is highly susceptible to wind erosion.
Beaches	342	--	--
Waters of the Atlantic Ocean	245	--	--
Pomello sand	229	0-2%	Moderately well drained soil, with a water table 30 to 60 inches below ground surface, This soil is highly susceptible to wind erosion.
Water	122	--	--
Arents, moderately wet	16	0-2%	Somewhat poorly drained soil, with a water table 18 to 36 inches below ground surface. This soil is highly susceptible to wind erosion.
Pompano sand	<1	0-2%	Poorly drained soil, with a water table 0 to 12 inches below ground surface, This soil is highly susceptible to wind erosion.

Sources: National Resources Conservation Service (NRCS) 2014; Hucklf et al. 1974

The majority of the mapped soils on CCAFS are sands, which would be expected on a barrier island. The soil type with the greatest coverage mapped within CCAFS is the Canaveral-Anclote complex, gently undulating (approximately 7,757 acres). Two or more soils are combined into a complex when the soils are in such an intricate pattern or in such small areas that the soils cannot be depicted separately on maps. In addition to Canaveral and Anclote soils, this complex contains minor components of Palm Beach and Pomello sands. Canaveral soil is typically found on the dunes and ridges on marine terraces with parent material from sandy marine deposits. The soil is found along the Atlantic Coast on narrow ridges interspersed with parallel narrow sloughs. The drainage is considered somewhat poorly drained with a depth to water table of about 12 to 36 inches. The Anclote soil forms on flats on marine terraces, with the same parent material as Canaveral soil. It is typically found on broad areas of floodplains, in marsh depressions in flatwoods, and poorly defined drainageways. The drainage class for Anclote is very poorly drained, with a depth to water table of about 0 to 6 inches (Hucklf et al. 1974). The

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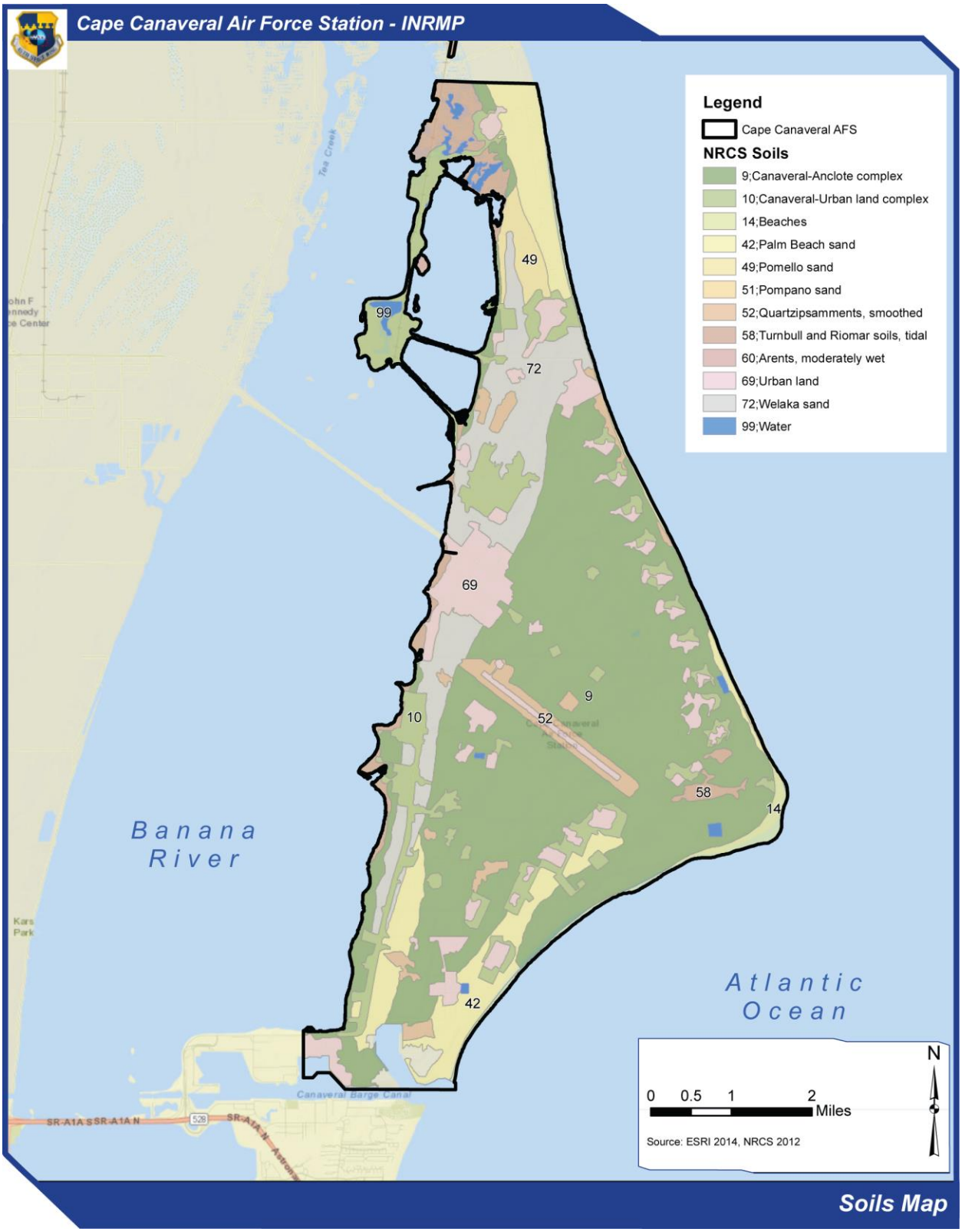

Figure 4-2. CCAFS Soils Map

Canaveral-Anclote complex, gently undulating is approximately 50 percent of the mapped soil types on CCAFS. Canaveral-Urban complex, approximately 11 percent of the mapped soil types, is found primarily around structures and impervious surfaces within CCAFS. These soils are moderately well drained with a depth to surface water of 30 to 60 inches (Hucklf et al. 1974).

The predominant wetland soils, Turnbull and Riomar soils, tidal (refer to **Table 4-4**) are located primarily in the northern part of CCAFS, adjacent to the Banana River. Turnbull is described as muck on top of clay, very poorly drained, with frequent flooding and ponding; the parent material is herbaceous organic matter over estuarine deposits. Riomar soil is mucky clay, very poorly drained, with frequent flooding and ponding; parent material is loamy and clayey marine deposits over limestone (Hucklf et al. 1974).

4.3.2.2 PAFB

Table 4-5 identifies the soil types and corresponding acreage found on PAFB, and **Figure 4-3** illustrates the soil types within PAFB.

Table 4-5. Major Soil Type Descriptions for PAFB

Soil Type	Acres	Slope	Description
Canaveral-Anclote complex, gently undulating	820	0-5%	Somewhat poorly drained soil, with a water table that is 12 to 36 inches below ground surface. This soil is highly susceptible to wind erosion.
Urban land	514	--	--
Canaveral-Palm Beach-Urban land complex	227	0-2%	Somewhat poorly drained soil, with a water table that is 12 to 36 inches below ground surface. This soil is highly susceptible to wind erosion.
Immokalee sand	174	0-2%	Poorly drained sandy soil, with a water table that is 10 to 40 inches below ground surface. This soil is highly susceptible to wind erosion.
Waters of the Atlantic Ocean	46	--	--
Welaka sand	41	0-2%	Excessively drained soil, with a water table that is more than 80 inches below ground surface. This soil is highly susceptible to wind erosion.
Canaveral-Urban land complex	31	0-2%	Moderately well drained soil, with a water table that is 30 to 60 inches below ground surface. This soil is highly susceptible to wind erosion.
Water	20	--	--
Basinger sand	15	0-2%	Poorly drained sand soil, with a water table that is 10 to 40 inches below ground surface. This soil is highly susceptible to wind erosion.
Palm Beach sand	15	0-5%	Excessively drained soil, with a water table that is more than 80 inches below ground surface. This soil is highly susceptible to wind erosion.
Pomello-Urban land complex	<1	0-2%	Moderately well drained soil, with a water table that ranges between 30 and 60 inches. This soil is highly susceptible to wind erosion.

Sources: NRCS 2014; Hucklf et al. 1974

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The majority of the mapped soils on PAFB are sands, which would be expected on a barrier island. Similar to CCAFS, the soil type with the greatest coverage mapped within PAFB is the Canaveral-Anclote complex, gently undulating (approximately 820 acres; 43 percent of mapped soils). Refer to the discussion in **Section 4.3.2.1** for a description of this soil type.

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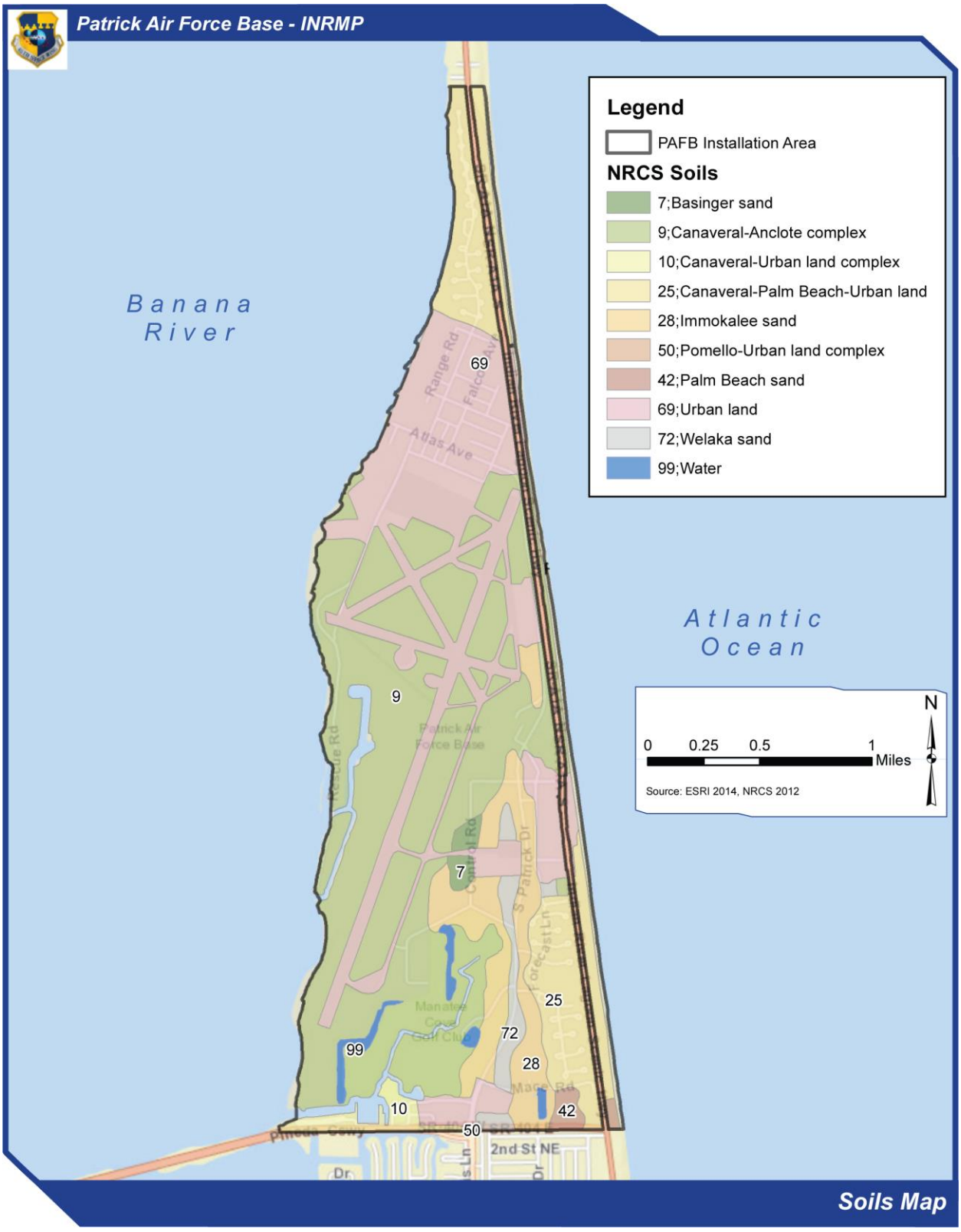

Figure 4-3. PAFB Soils Map

4.3.2.3 MTA

Table 4-6 identifies the soil types and corresponding soil acreage found within MTA. **Figure 4-4** illustrates the soil types found on MTA.

Table 4-6. Major Soil Type Descriptions for MTA

Soil Type	Acres	Slope	Description
Malabar, Holopaw, and Pineda soils	324	0-2%	Poorly drained soil with a water table between 10 and 40 inches.
EauGallie sand	258	0-2%	Poorly drained soil with a water table that is 6 to 18 inches below ground surface. This soil is highly susceptible to wind erosion.
Urban land	79	--	--
Quartzipsamments, smoothed	36	0-5%	Moderately well drained soil, with a water table that is 24 to 60 inches below ground surface. This soil is highly susceptible to wind erosion.
Pineda sand	29	0-2%	Poorly drained soil, with a water table between 0 and 12 inches below ground surface.
Wabasso sand	25	0-2%	Poorly drained soil, with a water table that is 6 to 18 inches below ground surface. This soil is highly susceptible to wind erosion.
EauGallie, Winder, and Riviera soils, depressional	22	0-2%	Very poorly drained soil, with a water table that is approximately 0 inches below ground level. This soil is highly susceptible to wind erosion.
Malabar sand, high	15	0-2%	Poorly drained soil, with a water table that is 0 to 12 inches below ground surface. This soil is highly susceptible to wind erosion.
Floridana sand	10	0-2%	Very poorly drained soil that has a surface layer of thick black sand. This soil has a water table that is between 10 and 30 inches.
Riviera sand	9	0-2%	Poorly drained soil, with a water table between 10 and 30 inches.

Sources: NRCS 2014; Hucklf et al. 1974

The most prevalent type of mapped soils at MTA includes a mixture of Malabar, Holopaw, and Pineda soils (approximately 324 acres; and 40 percent). This soil group surrounds the majority of the paved roadways located within MTA. With the exception of Quartzipsamments, smoothed (moderately well drained), the soils at MTA are poorly drained or very poorly drained, but are not prone to flooding and ponding (Hucklf et al. 1974).

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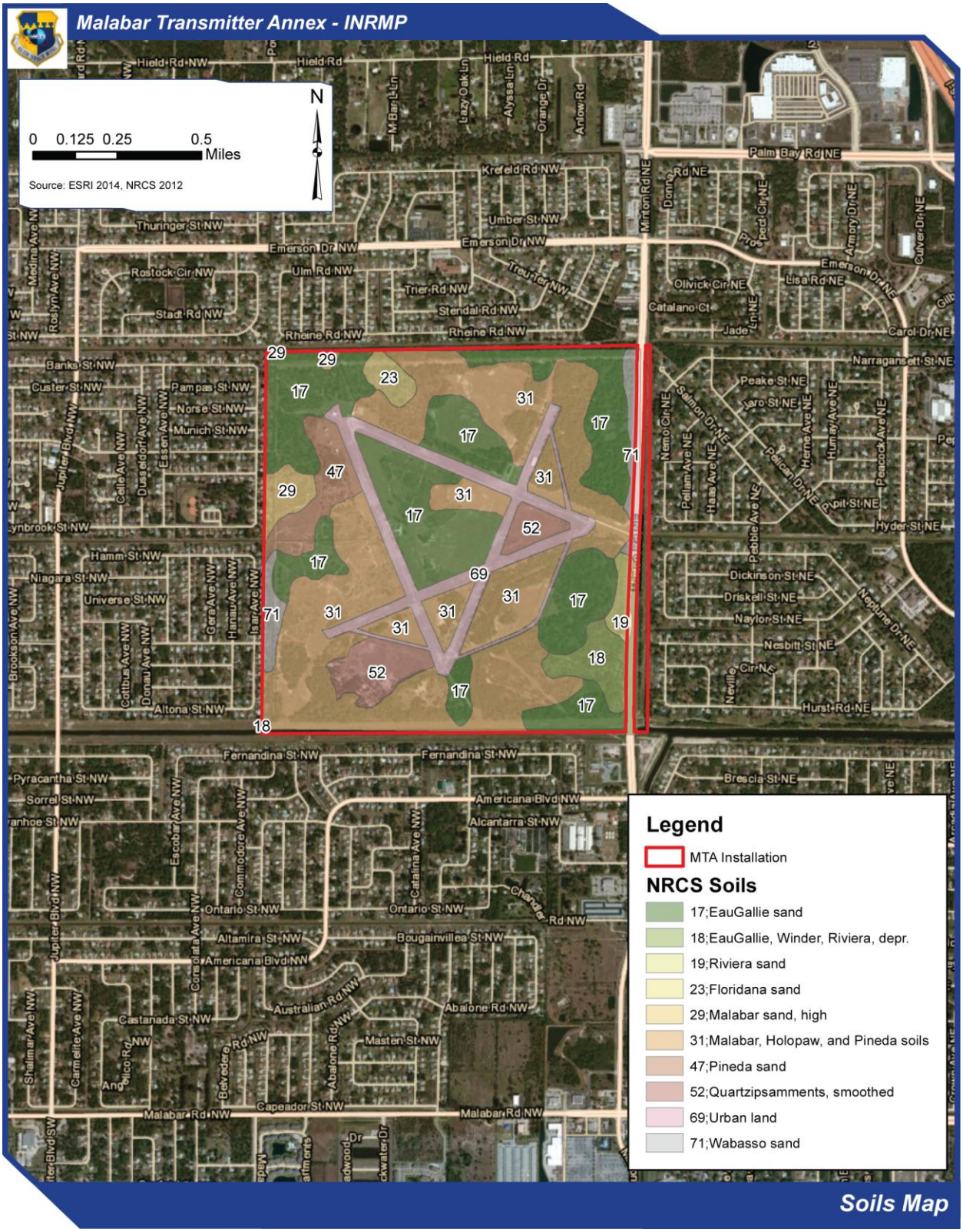

Figure 4-4. MTA Soils Map

4.3.2.4 JDMTA

The soils in Martin County are influenced by four major geologic formations including the Caloosahatchee Marl Formation (of the Pliocene era) as well as the Fort Thompson Formation, Anastasia Formation, and Pamlico Sand Formation (of the Pleistocene age). These formations generally consist of sand and varying amounts of shell, alternating beds of limestone, shell, sand, sandy limestone, sandstone, and marl of marine, estuarine, and freshwater origin. Pamlico Sand of the late Pleistocene age mantles all of Martin County and is the basic material in which most of the mineral soils have formed. The coastal ridge has deep, sandy soils that are excessively drained and not influenced by the groundwater table. In Martin County the sands are almost pure quartz sand and are highly resistant to weathering (McCollum and Cruz 1981).

Table 4-7 lists the soil type and associated acreage for each, and **Figure 4-5** illustrates the soil types found within JDMTA.

Table 4-7. Major Soil Type Descriptions for JDMTA

Soil Type	Acres	Slope	Description
Paola and St. Lucie sands, 0 to 8 percent slopes	3	0-8%	Excessively drained soil with a water table approximately 80 inches below ground surface. This soil is highly susceptible to wind erosion.
Paola and St. Lucie sands, 8 to 20 percent slopes	6	8-20%	Excessively drained soil with a water table approximately 80 inches below ground surface. This soil is highly susceptible to wind erosion.

Source: NRCS 2014; McCollum and Cruz 1981

The soils on the scrub ridges of JDMTA are mapped as Paola and St. Lucie sands, which are excessively drained deep, sandy soils occurring on nearly level to strongly sloping, dune-like ridges. Permeability is very rapid. The community type often associated with this soil is sand pine scrub. The soils can also be found on ridges and dunes of xeric uplands (McCollum and Cruz 1981).

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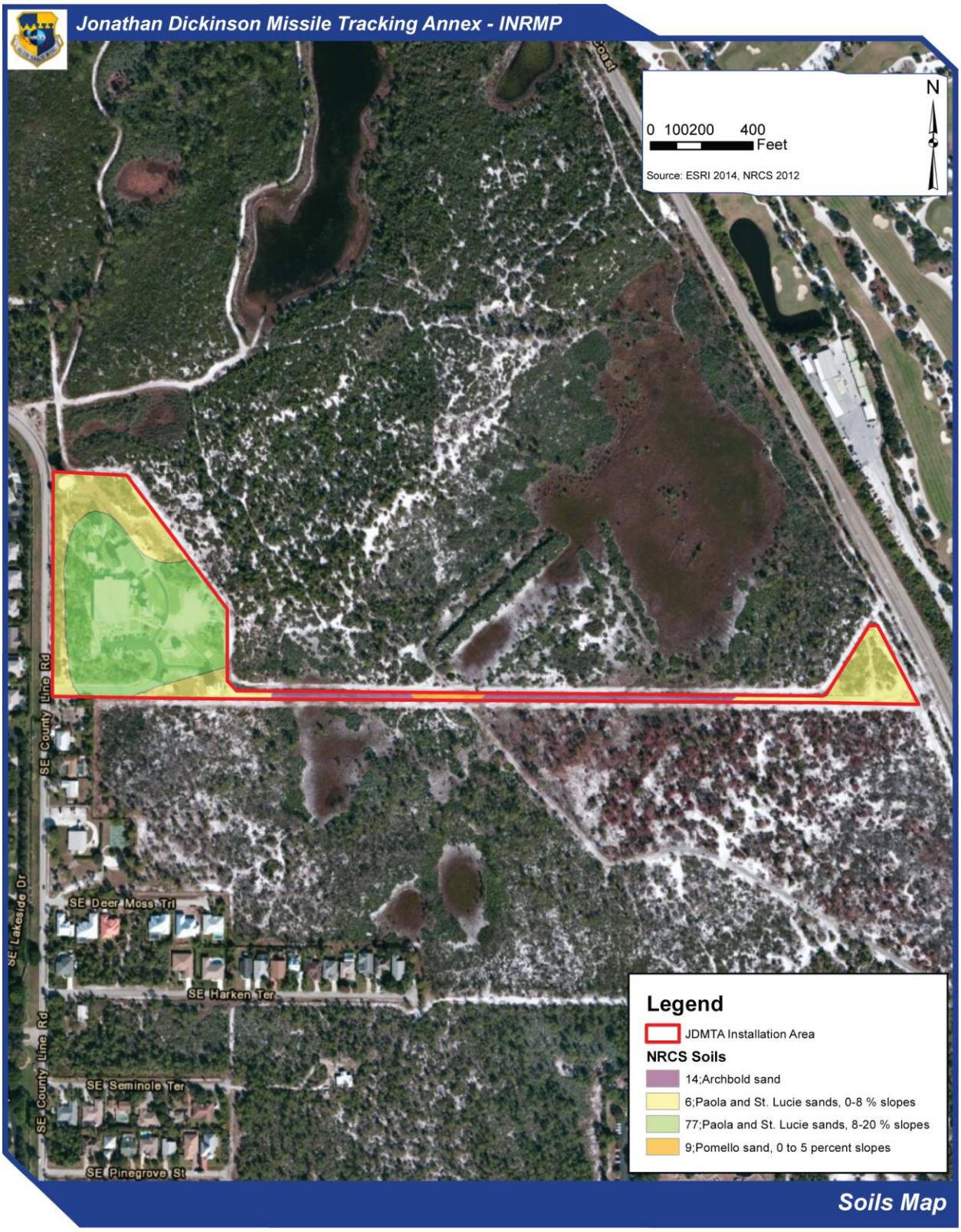

Figure 4-5. JDMTA Soils Map

4.4 Hydrology

Water resources considered in this INRMP encompass groundwater, surface water, floodplains, and coastal zones. Groundwater comprises subsurface water resources, which are essential to agricultural and industrial activities in many areas. Groundwater properties are often described in terms of depth to aquifer, aquifer or well capacity, and/or water quality. Surface water resources include lakes, rivers, streams, and wetlands which are important for ecological, economical, recreational, and health related reasons. Wetlands are discussed in detail in **Section 5.5**.

4.4.1 Groundwater

Two continuous aquifer systems, the surficial aquifer and the Floridan aquifer, are present in Brevard County. The surficial aquifer system is contained in undifferentiated Late Miocene, Pliocene, and Recent Pleistocene deposits. These deposits are composed primarily of medium to coarse quartz sands, with coquina and shell occurring more frequently at depth (Brown 1962). The surficial aquifer is hydrologically separated from the underlying Floridan aquifer by sediments of the Hawthorn Group of Miocene Age. The low permeability clays, silts, and marls of the Hawthorn Group are considered the aquitard between the non-artesian surficial and the artesian Floridan aquifer system. The Floridan aquifer system consists of a series of highly permeable limestone formations including the Ocala Group and the Avon Park Limestone, both of Eocene age. Water enters the surficial aquifer through direct infiltration from the percolation of rainwater. Groundwater deeper than the surficial aquifer is affected more by regional boundaries such as the Atlantic Ocean and the Banana River. Rates of groundwater movement are generally substantially less than one foot per day.

The surficial aquifer is typically classified by the Florida Department of Environmental Protection (FDEP) as a Class G-II aquifer (less than 10,000 milligrams per liter [mg/L] total dissolved solids [TDS]). Class G-II is defined as able to supply water treatable for human consumption; however, the surficial aquifer does not, nor is planned to, supply potable water at CCAFS.

4.4.2 Surface Water

The 45 SW installations within Brevard County, including CCAFS, PAFB, and MTA are all located within the IRL watershed within the Cape Canaveral sub-basin (Hydrologic Unit Code [HUC] 03080202) (US Environmental Protection Agency [USEPA] 2012). Specifically, CCAFS is located within the Banana River subwatershed (HUC 030802020201) and PAFB is located within the South Banana River subwatershed (HUC 030802020203) (USEPA 2012). Both of these installations are bordered by the Banana River to the west and the Atlantic Ocean to the east. MTA is located slightly more inland, approximately 1 mile to the west of the Indian River, within the Kid Creek subwatershed (HUC 030802020105).

JDMTA, in Martin County, is located within the Florida Southeast Coast sub-basin (HUC 03090206). Specifically, this installation is located within the Lower Loxahatchee River subwatershed (HUC 030902060604) (USEPA 2012).

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4.4.3 Water Quality

Florida is divided into five regional water management districts. Brevard County is located in the St. Johns River Water Management District (SJRWMD) and Martin County is located in the South Florida Water Management District (SFWMD). The water management districts are responsible for regulating the supply of drinking water and conserving the state's water resources (FDEP 2014).

The Section 303(d) list includes Florida water bodies that are not attaining one or more designated uses and require the establishment of Total Maximum Daily Loads (TMDLs) to meet and maintain Water Quality Standards. Both the Indian River (above the 520 Causeway) as well as the Banana River (above and below the 520 Causeway), located in close proximity to CCAFS, PAFB, and MTA are listed as impaired waters (USEPA 2010). Causes of impairment for the Indian River include low dissolved oxygen as well as fecal coliform and mercury in fish tissue above required thresholds. Similarly, causes of impairment in the Banana River include low dissolved oxygen and mercury in fish tissue above required thresholds (USEPA 2010). Further, the Loxahatchee River, in close proximity to JDMTA, is listed as an impaired water body due to low dissolved oxygen as well as algal growth, fecal coliform, and mercury in fish tissue above required thresholds (USEPA 2010).

4.4.4 Floodplains

Floodplains generally are areas of low, level ground present on one or both sides of a stream channel that are subject to periodic or infrequent inundation by flood waters. Floodplains are typically the result of lateral erosion and deposition that occurs as a river valley is widened. The porous material that composes the floodplain is conducive to retaining water that enters the soil during flooding events and at times when the groundwater table is elevated. Floodplains in their natural form are beneficial in reducing the number and severity of floods, minimizing non-point source water pollution, filtering storm water, providing habitat for plants and animals, and providing aesthetic appeal and outdoor recreation benefits. Inundation dangers associated with development of floodplains have prompted federal, state, and local legislation to limit floodplain development to recreation, agriculture, and preservation activities. Floodplains are regulated by the Federal Emergency Management Agency (FEMA) with standards outlined in 44 CFR Part 60.3. EO 11988 (Floodplain Management) requires agencies to assess the effects that their actions may have on floodplains and to consider alternatives to avoid adverse effects and incompatible development on floodplains.

4.4.4.1 CCAFS

CCAFS is included on the FEMA Flood Insurance Rate Maps (FIRMs) 12009C0265G, 12009C0355G, 12009C0360G, 12009C0361G, and 12009C0362G, effective March 2014 (FEMA 2014). Due to the lack of significant variances in topography on CCAFS, floodplains extend beyond the coastal dune and wetlands and into portions of all of the CCAFS upland plant communities. On CCAFS, the 100-year floodplain extends to 7 feet above msl on the ocean side and 4 feet above msl on the Banana River side. The 500-year floodplain elevations are 10 feet above msl on the ocean side of CCAFS and 6 feet above msl along the Banana River (**Figure 4-6**).

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4.4.4.2 PAFB

PAFB is included on FIRMs 12009C0463G, 12009C0526G, and 12009C0528G, effective March 2014 (FEMA 2014). Due to the lack of significant variances in topography on PAFB, floodplains extend beyond the coastal dune and wetlands and into portions of the developed land on PAFB. **Figure 4-7** displays the flood zone locations at PAFB.

4.4.4.3 MTA

MTA is included on FIRMs 12009C0681G, 12009C0679G, and 12009C0683G, effective March 2014 (FEMA 2014). A small isolated area in the southern region of MTA is designated as Zone A (**Figure 4-8**). These areas are subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies. However, because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown.

4.4.4.4 JDMTA

JDMTA is included on FIRM 12085C0526F, effective in October 2002 (FEMA 2014). Similar to MTA, JDMTA has a small isolated area to the northeast designated as Zone A, an area subject to inundation by the 1-percent-annual chance flood event (**Figure 4-9**).

4.4.5 Coastal Zone

The Florida Coastal Management Program (FCMP) was approved by National Oceanic and Atmospheric Administration (NOAA) in 1981 and is codified at Chapter 380, Part II, Florida Statutes (F.S.). The State of Florida's coastal zone includes the area encompassed by the state's 67 counties and its territorial seas. The FCMP consists of a network of 24 F.S. administered by eight state agencies and five water management districts. All of the 45 SW installations are located within the coastal zone.

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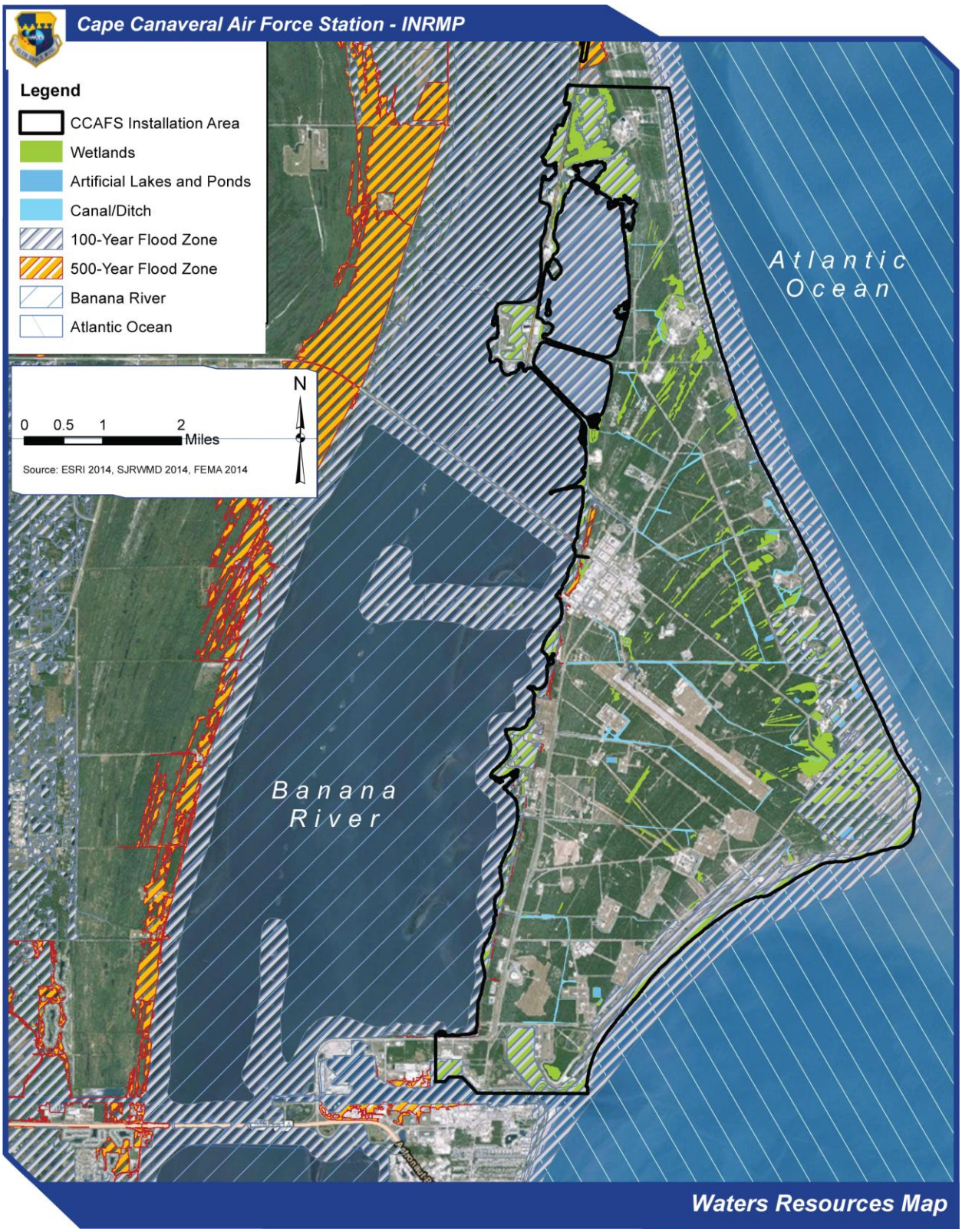
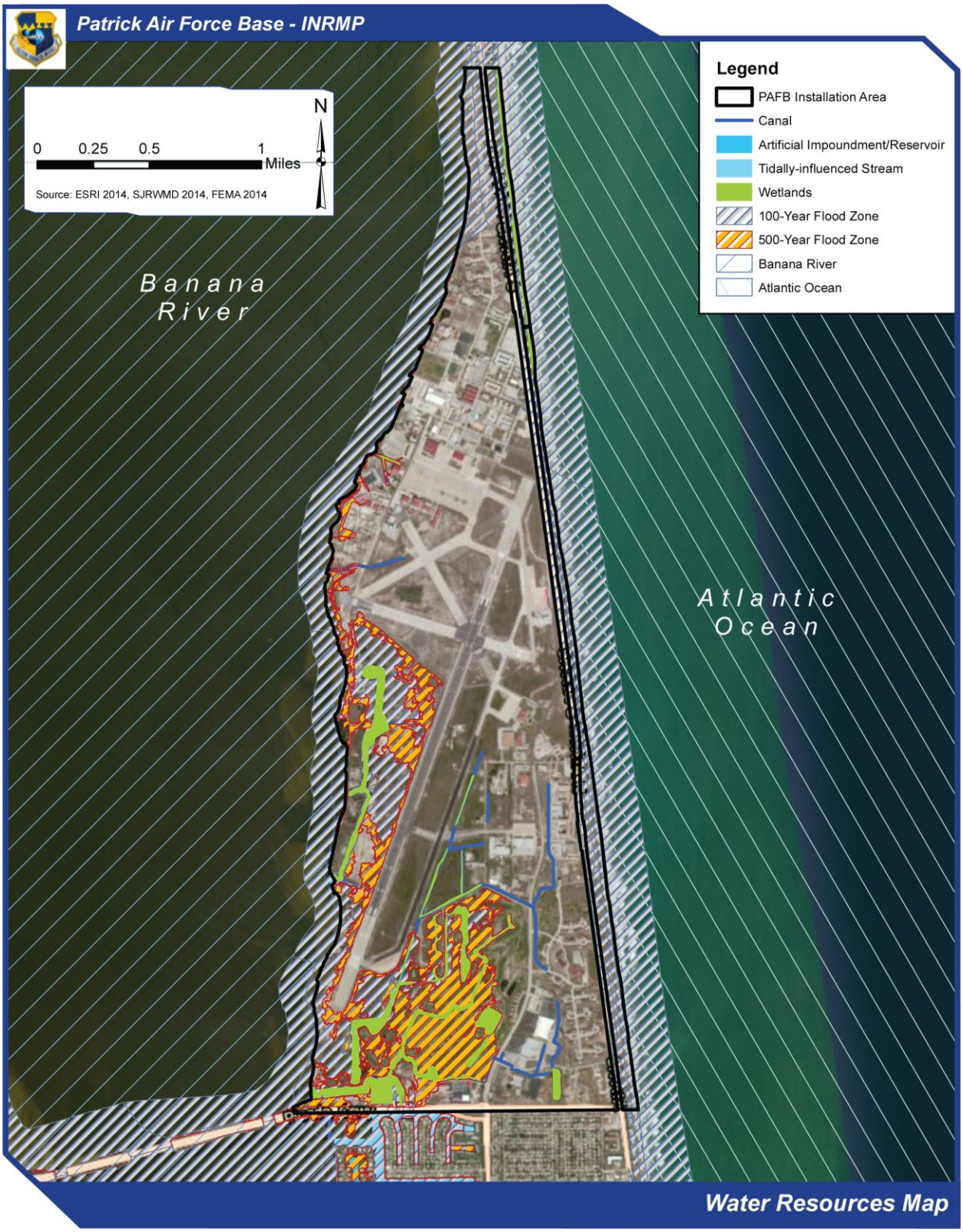


Figure 4-6. Water Resources, CCAFS



Figures 4-7. Water Resources, PAFB

Figure 4-8. Water Resources, MTA

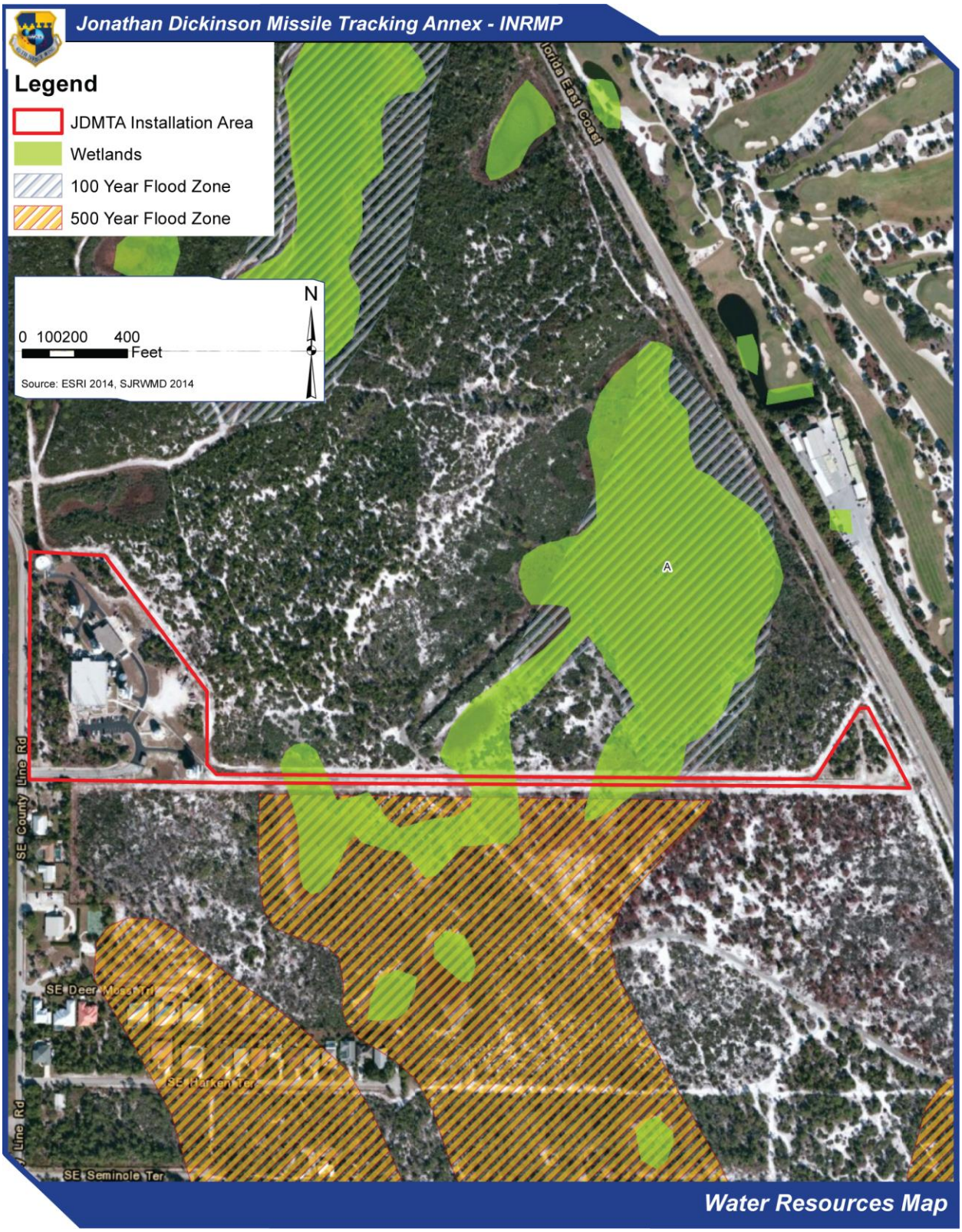


Figure 4-9. Water Resources, JDMTA

Chapter 5. Ecosystems and the Biotic Environment

Basic information about the ecosystems and biological resources at the 45 SW properties is required for the purposes of effectively implementing ecosystem management. The 45 SW has completed numerous biological studies and surveys to identify and describe the ecosystems found on CCAFS, PAFB, MTA, and JDMTA (see **Section 5.6.2**). A summary of the natural environment at these installations is provided below.

5.1 Ecosystem Classification

The 45 SW properties, including CCAFS, PAFB, MTA, and JDMTA are located within Outer Coastal Plain Mixed Province as described by Bailey et al. (1995), which is equivalent to the Eastern Temperate Forests (Level I) and Mississippi Alluvial and Southeast USA Coastal Plains (Level II) USEPA ecoregions [Commission for Environmental Cooperation (CEC) 1997].

The Outer Coastal Plain Mixed Province comprises the flat and irregular Atlantic and Gulf Coastal Plains down to the sea. Well over 50 percent of the area is gently sloping. Local relief is less than 300 feet, although some areas are gently rolling. Most of the region's numerous streams are sluggish and marshes, swamps, and lakes are numerous (Bailey et al. 1995). Temperate rainforest, also referred to as temperate evergreen forest or laurel forest, is typical in this province. Temperate rainforest has fewer species of trees than its equatorial or tropical counterparts, and hence larger populations of individual species. Trees are not as tall here as in low-latitude rainforests. Additionally, leaves are usually smaller and more leathery, and the leaf canopy less dense. There is usually a well-developed lower stratum of vegetation that may variously include tree ferns, small palms, shrubs, and herbaceous plants. Along the Atlantic coast, the extensive coastal marshes and interior swamps are dominated by eucalyptus (*Eucalyptus* spp.) and cypress. Most upland areas are covered by subclimax pine forest, which has an understory of grasses and sedges called savannas. Undrained shallow depressions in savannas form upland bogs or pocosins, in which evergreen shrubs predominate (Bailey et al. 1995).

Within this Outer Coastal Plain Mixed Province, the 45 SW properties are located in the Lower Coastal Plains and Flatwoods Section (McNab and Avers 1994). Following the USEPA ecoregion hierarchy, this is equivalent to the Eastern Florida Flatwoods (Level IV), which occurs within the Southern Coastal Plain (Level III) (CEC 1997). The predominant landform in the Lower Coastal Plains and Flatwoods Section is a flat, weakly dissected alluvial plain and was formed by deposition of continental sediments onto a submerged, shallow continental shelf, which was later exposed by sea level subsidence. About 90 percent of this Section consists of irregular or smooth plains. Elevation ranges from 80 to 660 feet. Local relief ranges from 10 to 30 feet on smooth plains, and from 30 to 50 feet in areas of hills (McNab and Avers 1994).

The predominant vegetation in this region is comprised of evergreen needle-leaved trees with scattered areas of cold-deciduous and evergreen broad-leaved forest. Slash and longleaf pines are prevalent as well. Sand pine (*Pinus clausa*) is prevalent in xeric, deep-sand areas of Florida. The oak-gum-cypress forest cover type is common along flood plains of major rivers. Localized areas of mostly hardwoods occur, especially in central Florida; types include laurel oak (*Quercus laurifolia*), water oak (*Quercus nigra*), sweetbay (*Magnolia virginiana*), sweetgum

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(*Liquidambar styraciflua*), live oak (*Quercus virginiana*), red maple (*Acer rubrum*), and spruce pine (*Pinus glabra*). Additionally, an extensive area of grassland vegetation is present in central Florida, north of Lake Okeechobee (McNab and Avers 1994).

Fire has been the principal historical disturbance, previously burning over medium to large size areas between natural barriers, generally with moderate frequency and low intensity. Fire occurrence is common in areas dominated by sand pine and is frequent in areas of longleaf pine. Fire intensity can range from moderate to high. Climatic influences include frequent hurricanes (McNab and Avers 1994).

5.2 Vegetation

5.2.1 Historic Vegetative Cover

According to the *General Map of Natural Vegetation of Florida* (Davis 1967), the vegetative community in the vicinity of CCAFS and PAFB was historically dominated by coastal strand habitats. Vegetation in a coastal strand community grows on sand dunes and rock. Near the shore, pioneer herbs and shrubs (often succulents) were likely present, and scrub and forest zones were likely present in the more interior area (Davis 1967).

Historic vegetation in the vicinity of MTA location was likely dominated by pine flatwoods and/or sand pine scrub forest (Davis 1967). Pine flatwoods is described by Davis (1967) as open woodlands characterize by some combination of longleaf pine (*Pinus palustris*), slash pine (*Pinus elliottii*), and pond pine (*Pinus serotina*) as well as herbaceous vegetation, saw palmetto (*Serenoa repens*), shrubs, and small trees forming the understory. Small hardwood forests, cypress swamps, marshes, and bay swamps may also be found within a flatwoods community. The sand pine scrub forest community was likely found on excessively drained deep sandy soils, often on old dunes (Davis 1967) Vegetation often included many low trees/shrubs and often sand pine. Common scrub oak species included myrtle oak (*Quercus myrtifolia*), sand live oak (*Quercus geminata*), and Chapman's oak (*Quercus chapmanii*). This scrub vegetation community was widely scattered in south Florida, often on dunes along the Atlantic Ocean (Davis 1943a). However, historic photos indicate that the flatwood forests that historically dominated MTA were clear cut prior to 1960.

According to the *Vegetation Map of Southern Florida* (Davis 1943b), the vegetative community in the vicinity of JDMTA was likely a scrub forest or saw palmetto/dry prairie. The saw palmetto/dry prairie community is described as occurring on nearly level land and vegetation was variable. Vegetation may include short grasses, low shrubs including saw palmetto, and other herbaceous vegetation (Davis 1943a).

5.2.2 Current Vegetative Cover

For more details on natural vegetative communities on 45 SW properties, see **Appendix D**.

5.2.2.1 CCAFS

Florida is characterized by a unique ecology that includes both temperate and tropical flora. The transitional area in Florida between the temperate and tropical zones on the East Coast occurs around Cape Canaveral (Myers and Ewel 1990). As a result CCAFS supports a large diversity

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of floral species and plant communities. Additionally, the occurrence and distribution of natural communities on CCAFS is the result of a complex geological history. Limestone bedrock formation, fluctuating sea levels related to glacial advance and retreat, and more recent coastal processes of erosion and deposition have all shaped the geology and physiography of the Canaveral Peninsula. Generally, older natural communities are found on the westward margin of the Canaveral Peninsula, along the Banana River. Newer and successional communities are forming along the eastern coast of the peninsula.

All historic vegetative communities known to occur on CCAFS presently exist in some form. However, the extent and distribution of these natural communities at the installation has been impacted by historic human settlement activities and development associated with the creation and operation of the launch base. The natural landscape of CCAFS is fragmented by space launch complexes (SLC), buildings, roads, ditches, sight lines, and an aircraft runway. A canal network has affected hydrology. Fire exclusion has affected vegetative communities. And the introduction and establishment of invasive, exotic vegetation has also altered the vegetative communities. However, good examples of natural communities were observed during a delineation and evaluation of the maritime hammocks within CCAFS (Gulledge et al. 2009). Gulledge et al. (2009) identified 13 natural communities/land cover types with CCAFS (see **Table 5-1** and **Figure 5-1**).

Table 5-1. Natural Communities within CCAFS

Natural Community	Total Surveyed Area (acres)
Beach dune[a]	6
Coastal grassland[b]	N/A (included below)
Coastal strand	1,728
Basin marsh	75
Coastal interdunal swale	142
Maritime hammock	2,291
Live oak/saw palmetto hammock	1,237
Live oak/saw palmetto shrubland	1,477
Xeric hammock	556
Scrub	1,083
Tropical hammock	113
Hydric hammock	9
Mangrove or exotics	901

Source: Gulledge et al. 2009; FNAI 2012

Notes: [a] Beach dune community is present within CCAFS, but was not mapped by Gulledge et al. (2009) since this area is not within a management zone; acreage for the beach dune community is based on FNAI (2012) vegetative cover data.

[b] Coastal grassland acreage is included within the coastal strand acreage (Gulledge et al. 2009).

The general characteristics of each the communities identified by Gulledge et al. (2009) are described below. Detailed descriptions of these natural communities can be found in **Appendix D.**

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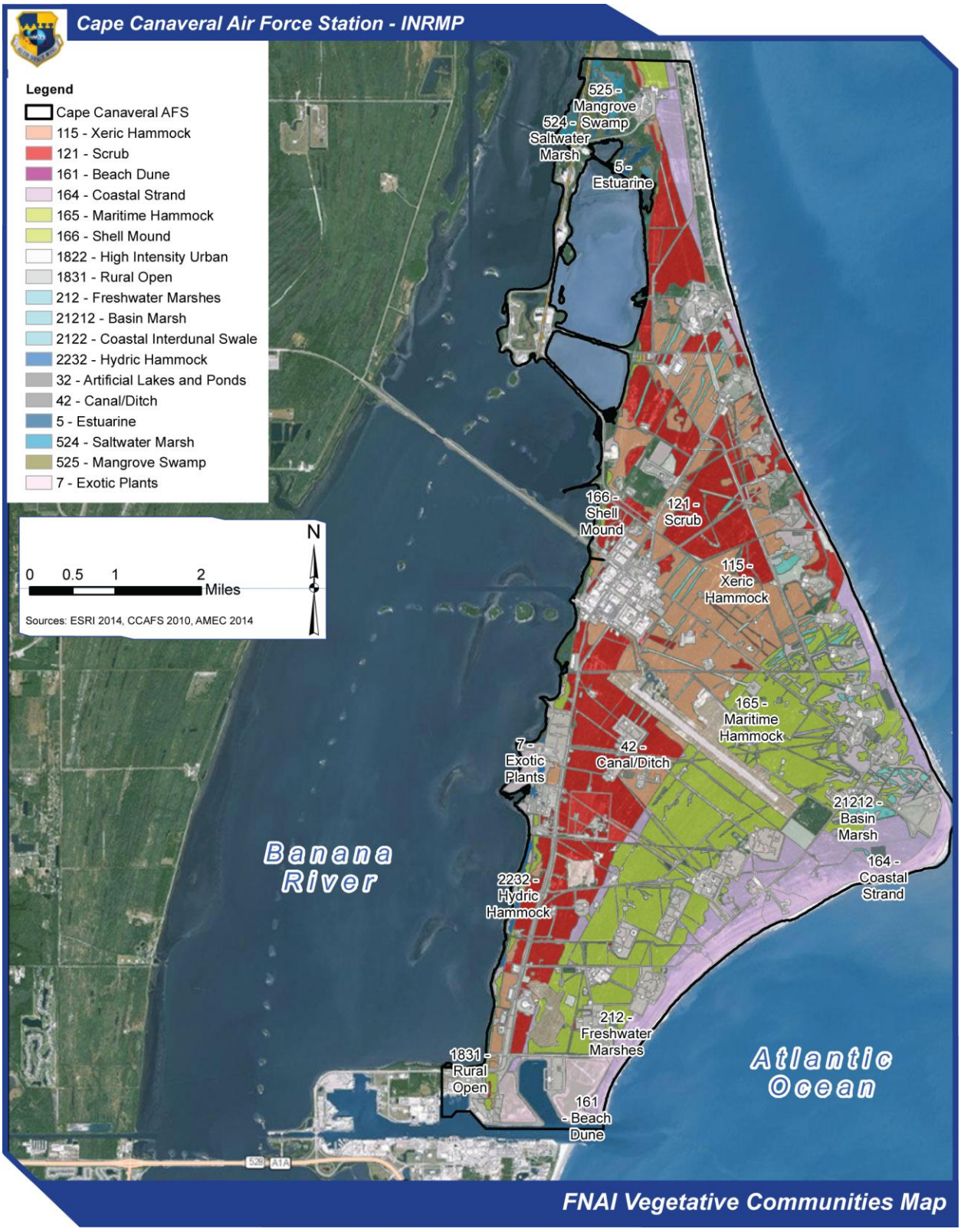

Figure 5-1. CCAFS Natural Communities Map

Beach dune is an upland community with predominantly herbaceous vegetation including coastal specialist plants on the vegetated upper beach and foredune (FNAI 2010). The beach dune community is highly unstable and dynamic as it is an inhospitable environment for most plant species. Characteristic plant species within a beach dune community include sea oats (*Uniola paniculata*), beach elder (*Iva imbricata*), railroad vine (*Ipomoea pes-caprae*), beach croton (*Croton punctatus*), bitter panic grass (*Panicum amarum*), saltgrass (*Distichlis spicata*), camphorweed (*Heterotheca subaxillaris*), and beach cordgrass (*Spartina patens*). The beach dune vegetation community is present within CCAFS, but was not mapped by Gulledge et al. (2009) because most of these areas are not within management zones.

Coastal grassland is an upland community with predominantly herbaceous vegetation found in the drier portions of the transition zone between beach dunes and more inland communities dominated by woody species, such as coastal strand or maritime hammock. It occurs primarily on the broader barrier islands and capes along the sandy coasts of Florida. Characteristic plant species include bluestems (*Andropogon* spp.), camphorweed (*Heterotheca subaxillaris*), and earleaf greenbrier (*Smilax auriculata*) (FNAI 2010). Gulledge et al. (2009) included coastal grassland acreage within the mapped coastal strand community.

Coastal strand is an upland community that develops in the absence of natural disturbance on somewhat older deposits of sand, inland of beach or coastal grassland. It is a dense, shrub-dominated community that grades landward into scrub or maritime hammock. The most distinctive feature of coastal strand is the wedge-shaped profile of its low canopy, which is constantly pruned and shaped by windborn salt spray (FNAI 2010). Coastal strand is often found between dunes. This dense evergreen shrub community is usually dominated by live oak, buckthorn (*Sideroxylon tenax*), sea grape (*Coccoloba uvifera*), wax myrtle (*Myrica cerifera*), and saw palmetto (FNAI 2010).

Basin marsh is a freshwater herbaceous marsh that is regularly inundated. The basin marsh is typically not small, nor is it found in shallow inclusions within a fire-maintained community; these are characteristics of a depression marsh. The basin marsh may be present in a variety of situations. Vegetation in a basin marsh typically occurs in zones from deepest to shallowest water: submersed, floating leaved, emergent, and grassy species. Patches of shrub may occur in any of the zones. Characteristic plant species of a basin marsh include sawgrass (*Cladium jamaicense*), sand cordgrass (*Spartina bakeri*), American white waterlily (*Nymphaea odorata*), maidencane (*Panicum hemitomum*), pickerelweed (*Pontederia cordata*), bulltongue arrowhead (*Sagittaria lancifolia*), giant leather fern (*Acrostichum danaeifolium*), and herb-of-grace (*Bacopa monnieri*) (FNAI 2010).

Coastal interdunal swale is freshwater wetland community formed in linear depressions found between successive dune ridges such as sandy barrier islands, capes, or beach plains and may take the form of a marsh, damp flats, moist grasslands, or dense shrubs. The predominant vegetative species can vary depending on local hydrology, substrate, and the age of the swale (FNAI 2010).

Maritime hammock is an upland community, predominantly evergreen hardwood forest that grows on stabilized coastal dunes located at varying distances from the shoreline. The species

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composition changes based on latitude; north of Cape Canaveral includes temperate species, and south of Cape Canaveral includes more tropical plant species (FNAI 2010). Due to the location of Cape Canaveral, both temperate and tropical plant species are likely present within this community on CCAFS. Characteristic maritime hammock plant species include temperate species such as live oak, cabbage palm (*Sabal palmetto*), redbay (*Persea borbonia*), and red cedar (*Juniperus virginiana*) as well as tropical species such as gumbo limbo (*Bursera simaruba*), seagrape, and white or Spanish stopper (*Eugenia* spp.) (FNAI 2010). Gulledge et al. (2009) delineated 163 maritime hammocks within CCAFS, with 11 hammocks ranked as excellent quality, 97 as good quality, and 55 as fair quality.

Live oak/saw palmetto hammock is an upland forest type with low species diversity intermediate between a maritime hammock and a xeric hammock. It may be a result of long term fire exclusion and does not easily fit into the FNAI natural community categories (FNAI 2010).

Live oak/saw palmetto shrubland is an upland forest type, and like the live oak/saw palmetto hammock community, it does not fit easily into FNAI natural community categories. Similar to the live oak/saw palmetto hammock community, this vegetation community may also be a result of long term fire exclusion (FNAI 2010).

Xeric hammock is an upland evergreen forest community found on well-drained sandy soils and in areas of fire exclusion. The tree canopy in this community is generally low and closed, and is often dominated by sand live oak, although other oak trees may be present. An emergent canopy of pine may also be present. The understory is typically open. In addition to sand live oak, other characteristic species of the xeric hammock may include saw palmetto, myrtle oak, Chapman's oak, turkey oak (*Quercus cerris*), and bluejack oak (*Quercus incana*) (FNAI 2010).

Scrub is a community composed of evergreen shrubs, with or without a canopy of pines, and is typically found on dry, acid, sandy ridges. Characteristic species of this upland community include Florida rosemary (*Ceratiola ericoides*), sand pine, myrtle oak, live oak, and Chapman's oak. Rusty staggerbush (*Lyonia ferruginea*) and saw palmetto are also frequently observed in this community (FNAI 2010).

Tropical hammock is not specifically described by FNAI (2010); however, it is synonymous with FNAI's rockland hammock community. Rockland hammock is described as an upland rich tropical hardwood forest community that grows where limestone is very near the ground surface. The canopy and shrub layer in this community are closed, with significant leaf litter, and very few herbaceous plants. Over 120 native tree and shrub species can be found in a rockland hammock (FNAI 2010). Tropical hammock is ecologically significant as it provides habitat for numerous tropical species near the northern limits of their range (FNAI 2010). Within CCAFS, the tropical hammock community was observed in a nearly continuous band bordering the Banana River along the west edge of CCAFS, in association with Native American shell mounds which have soils with higher pH.

Hydric hammock is a wetland community of well developed evergreen hardwood and/or a palm forest. The understory vegetation varies, but it is frequently dominated by palms and ferns

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occurring on moist soils, often with limestone very near the ground surface. While its species composition varies, this community generally has a closed canopy of oaks and palms, an open understory, and a sparse to a moderate groundcover of grasses and ferns. Characteristic plant species include laurel oak, live oak, cabbage palm and red cedar (FNAI 2010). Hydric hammock within CCAFS occurs along the Banana River at the west edge of the tropical hammock.

Mangroves are indigenous to the Florida coast and are protected under F.S. due to their valuable contribution to erosion control, improved water quality, and habitat. Patchy areas of mangroves and salt bush/marsh communities are located on the western side of CCAFS and PAFB, in the Banana River.

5.2.2.2 PAFB

PAFB is heavily developed, with the majority of the vegetation on PAFB consisting of turf and landscaped areas (see **Section 5.2.3**). However, there are two natural communities, including beach dune and estuarine wetlands, which make up a small percentage of vegetative communities present at PAFB. **Figure 5-2** depicts the communities, and **Table 5-2** identifies those natural communities and associated acreage within PAFB.

Table 5-2. Natural Communities within PAFB

Natural Community	Total Area [(a)] (acres)
Beach dune	29
Estuarine wetlands (mangrove)	3
Hardwood forested uplands [(b)]	35

Source: FNAI 2012

(a) Acreage based on FNAI (2012) vegetative cover data

(b) 45 CEC/CEIE-C staff indicate the FNAI-designated hardwood forested uplands is actually a restoration area in process (recent invasive plant removal), with cabbage palm, other desirable native plant species (shrub and herbaceous), and white and red mangrove along the Survival Canal fringe.

Beach dune For a description of this community, refer to **Section 5.2.2.1**. The beach dune community on PAFB occurs to the east of SR A1A, and on the Banana River shoreline (i.e., the western boundary of PAFB). In an effort to assess the characteristics of the beach dune community at PAFB, a comprehensive dune survey (Oddy et al., 1997) was conducted that identified the presence and distribution of native vegetative plants on the beach dune. Based on that study, the beach and associated dune vegetation comprises 3.2% of the installation land area, which is the most extensive natural community found on PAFB.

Estuarine wetlands can include mangrove and salt marsh communities, which are both present on PAFB. For a description of mangrove communities refer to **Section 5.2.2.1**. Salt marsh is primarily an herbaceous community, affected by tides, but is protected from large waves. The salt marsh community at PAFB is protected by the barrier island. Characteristic species of a salt marsh may include saltmarsh cordgrass (*Spartina alterniflora*), needle rush (*Juncus roemerianus*), perennial glasswort (*Sarcocornia ambigua*), saltmeadow corgrass (*Spartina patens*), marsh elder (*Iva frutescens*), and christmasberry (*Lycium carolinianum*).

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Figure 5-2. PAFB Natural Communities and Land Use Map

5.2.2.3 MTA

Four natural communities occur within MTA, as defined by the *Guide to the Natural Communities of Florida* (FNAI 2010), have been described and documented by Schultz and Knight (1997). These communities include depression marsh, hydric hammock, mesic flatwoods, and wet flatwoods. However, these natural communities do not provide high quality habitat due to the extensive surrounding development. Additional natural communities were identified during a study conducted in 2014 (VZ Technologies, LLC et al. 2014b). A brief description of each community is discussed below; detailed descriptions of these communities within MTA are located in **Appendix D. Figure 5-3** and **Table 5-3** identifies the natural communities within MTA and the associated acreage for each community type.

Table 5-3. Natural Communities within MTA

Natural Community	Total Area (acres)
Mesic flatwoods [a]	265
Mixed hardwood-coniferous [a]	4
Prairies and bogs [a]	33
Wet flatwoods [a]	3
Natural rivers and streams [a]	3
Mixed Rangeland (code 330) [b]	NC
Cabbage Palm Hammock (code 428) [b]	NC
Pine Flatwoods (code 411) [b]	NC
Hydric Pine Flatwoods (code 625) [b]	NC
Streams & Waterways (code 510) includes ditches, canals [b]	NC

Source: VZ Technologies, LLC et al. 2014b; FNAI 2012

Notes: (a) Acreage based on FNAI (2012) vegetative cover data for MTA.

(b) Natural community types based on Florida Land Use, Cover and Forms Classification System (FLUCFCS) (FDOT 1999) determined by VZ Technologies et al (2014b) during field work conducted at MTA in 2013 and 2014; acreage of these communities was not calculated for the baseline survey.

NC = Not Calculated

Mesic flatwoods typically consist of an open canopy of tall pines and low, dense ground layer of shrubs and herbaceous plants. Plants species characteristic of this community may include: longleaf pine (*Pinus palustris*), slash pine (*Pinus elliottii*), saw palmetto (*Serenoa repens*), gallberry (*Ilex glabra*), staggerbush (*Lyonia fruticosa*), fetterbush (*Lyonia lucida*), shiny blueberry (*Vaccinium myrsinites*), wiregrass (*Arista stricta*), panic grass (*Dichanthelium* spp.), and broomsedges (*Andropogon* spp.) Mesic flatwoods is the most widespread community in Florida. (FNAI 2010)

Wet prairie and bogs are wetland communities. The wet prairie is continuously wet, but not inundated, and is often found on flat or gently sloped areas between depression marshes, shrub bogs, mesic flatwoods or dome swamp. Bogs are found on mucky soils, with water less than one foot deep. The wet prairie is an herbaceous community dominated by herbaceous vegetation. Characteristic plant species for this community may include: yellow-eyed grass (*Xyris* spp.), pitcher plants (*Sarracenia* spp.), wiregrass, toothache grass (*Ctenium aromaticum*), water cowbane (*Oxypolis filifolia*), beaksedges (*Rhynchospora* spp.), and flattened pipewort (*Eriocaulon compressum*). Wet prairie communities have a diversity of vegetation. (FNAI 2010)

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Pine flatwoods can be found throughout the central Florida area (VZ Technologies, LLC et al. 2014b). This habitat type has a canopy that is dominated with a mature stand of slash pine. The midstory trees consist of slash pine, laurel oak, live oak, cabbage palm, winged sumac (*Rhus copallina*), and Brazilian pepper (*Schinus terebinthifolius*). The epiphytic Spanish moss (*Tillandsia usneoides*) is also seen growing on oak trees. Vines such as muscadine grape (*Vitis rotundifolia*), wild balsam apple (*Momordica charantia*) and rosary pea (*Abrus precatorius*) are found occasionally growing on the midstory trees. Golden polypody (*Phlebodium aureum*) and shoestring fern (*Vittaria lineate*) are also found growing from the bases of petioles on cabbage palms. The understory was vegetated with saw palmetto, gallberry, fetterbush, American beautyberry (*Callicarpa americana*), and Brazilian pepper. The ground cover consists of a sparse amount of little bluestem (*Schizachyrium scoparium*), golden rod (*Solidago* spp.), cypress witchgrass (*Dichanthelium dichotomum*), shiny blueberry (*Vaccinium myrsinites*), bracken fern (*Pteridium aquilinum*), sword fern (*Nephrolepis exaltata*), lantana and flattop goldenrod. The forest floor has a thick leaf litter and duff layer indicating an absence of fire for several years (VZ Technologies, LLC et al. 2014b).

Cabbage palm hammock communities are comprised purely or predominantly of cabbage palm and can be associated with slash pine. Small islands of this community are embedded in the pine flatwoods. The canopy is mature slash pine, occasional live oak, with a midstory of cabbage palm. Vines such as muscadine grape or greenbrier (*Smilax* spp.) are found growing on the cabbage palm. Golden polypody and shoestring fern were found growing from the bases of petioles on cabbage palms. Ground cover consists of lantana, African spotted orchid (*Oeceoclades maculata*), common guava (*Psidium guajava*) and cabbage palm seedlings.

Hydric pine flatwoods This forested wetland classification has a sparse to moderate canopy of slash pine. The midstory includes very few slash pine and cabbage palm. The understory has sparse saw palmetto and gallberry. The ground cover includes bachelor button (*Polygala nana*), bog bachelor buttons (*Polygala lutea*), tickseed (*Coreopsis gladiata*), sundew (*Drosera capillaris*), St. Johns wort (*Hypericum* spp.), bog buttons (*Lachnocaulon anceps*), white bracted sedge (*Dichromena latifolia*), marsh pinks (*Sabatia* spp.), queensdelight (*Stillingia sylvatica*), rush-fuirena (*Fuirena scirpoidea*), common stargrass (*Hypoxis juncea*), blue maidencane (*Amphicarpum muhlenbergianum*), swamp sneeze weed (*Helenium pinnatifidum*), arrowfeather grass (*Aristida purpurascens*), Florida dropseed grass (*Sporobolus floridannus*), and common carpet grass (*Axonopus affinis*) (VZ Technologies, LLC et al. 2014b).

5.2.2.4 JDMTA

Approximately 80 percent of JDMTA is developed, while the remaining 20 percent is comprised of scrub “islands” typical of the rosemary scrub habitat. **Figure 5-4** and **Table 5-4** depict and identify the vegetative community for JDMTA.

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Table 5-4. Natural Communities within JDMTA

Natural Community	Total Area (acres)
Scrub (disturbed)	2 [(a)]

Source: FNAI 2012

Notes: [(a)] FNAI vegetative cover data for JDMTA reflects the entire installation is scrub community. Although the entire installation is not scrub – the majority of it is developed for military mission activities - the FNAI data is likely due to the small size of JDMTA (11 acres). Therefore, the acreage above is an approximate acreage of scrub, based on the estimated percentage of scrub habitat within JDMTA (20 percent).

Scrub is a community composed of evergreen shrubs, with or without a canopy of pines, and is found on dry, infertile, sandy ridges. The signature scrub species – three species of shrubby oaks, Florida rosemary (*Ceratiola ericoides*), and sand pine – are common to scrubs throughout the state. The dominance of these species, however, is variable from site to site (FNAI 2010). The scrub islands at JDMTA are vegetated primarily by the following dominant plants scrub oak, sand live oak (*Quercus geminata*), sand pine, Florida rosemary, saw palmetto, and wild blueberry (*Vaccinium spp.*).

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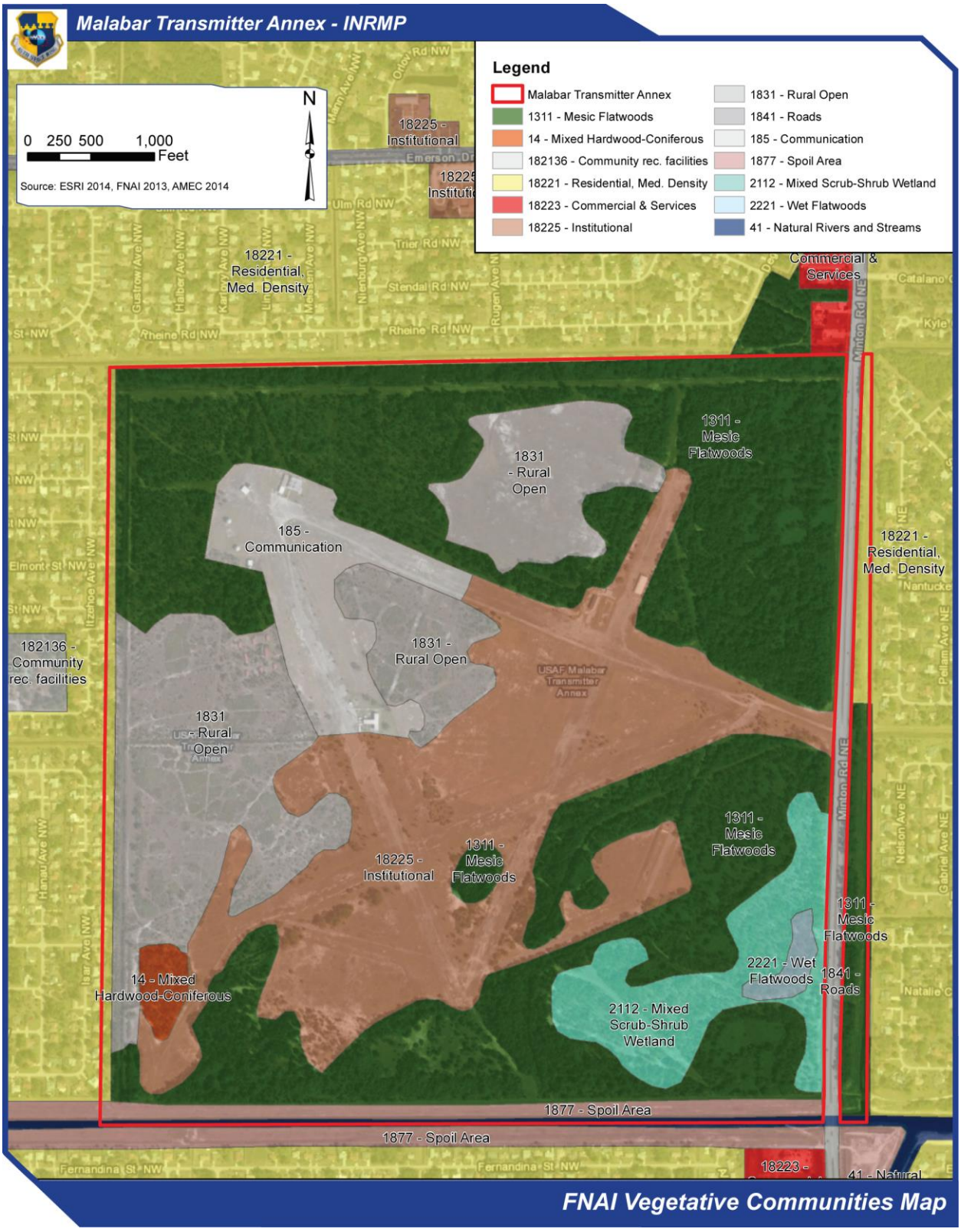

Figure 5-3. MTA Natural Communities Map

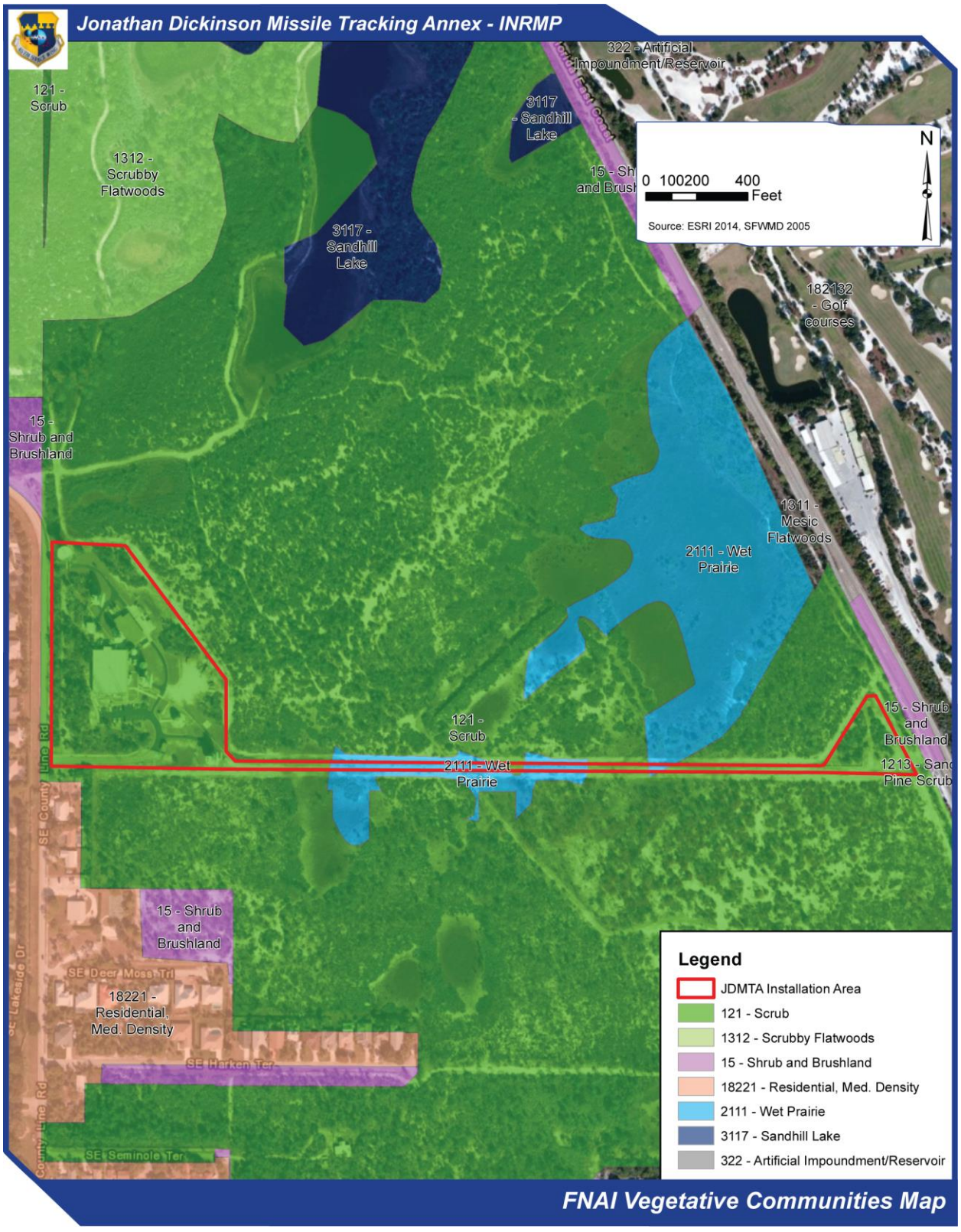

Figure 5-4. JDMTA Natural Communities

5.2.3 Turf and Landscaped Areas

The 45 SW expends a substantial effort managing turf and landscaped area on its properties, including CCAFS, PAFB, MTA, and JDMTA. Proper grounds maintenance and landscaping is implemented to maintain healthy grass, trees, shrubs, and plants, and present a clean, neat, and professional appearance. Grounds are divided into three categories – improved, semi-improved, unimproved – to distinguish the level of grounds maintenance and landscaping design activities required. Grounds maintenance at each of these installations, including mowing, is conducted in a way that minimizes impacts to biological resources. Refer to **Appendix H** for a detailed description of improved, semi-improved, and unimproved lands as well as a description of the grounds maintenance that occurs within these areas at CCAFS and PAFB.

5.3 Fish and Wildlife

Wildlife habitat at CCAFS, PAFB, MTA, and JDMTA is primarily associated with the natural communities at each of the 45 SW properties. While wildlife also occurs in developed areas of these installations, these species are generally more accustomed to disturbance and human interaction. Migratory bird surveys have been conducted at all of the 45 SW properties (Fleming and Greenwade 2007). Additionally, substantial baseline surveys have been conducted at CCAFS (FNAI 1998; Reyier et al. 2010; Reyier et al. 2011), PAFB (Schutz and Knight 1997; Oddy et al. 1997), and MTA (VZ Technologies, LLC et al. 2014b). However, there are likely additional species that occur on 45 SW properties but remain undocumented. A list of all documented species is included in **Appendix F** and high and medium priority special status species are discussed in **Appendix C**.

The health of wildlife and fish and their habitat on CCAFS, PAFB, MTA, and JDMTA is, in large part, dependent on the quality of natural communities that serve as habitat. Maintaining natural vegetation is vital to the health of fish and wildlife species on 45 SW properties. **Section 7.2** provides a summary of management for fish and wildlife.

5.3.1 Essential Fish Habitat

Essential Fish Habitat (EFH) requirements are established by the 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA). EFH can generally be defined as the waters and substrates necessary to fish for all stages of their life cycle (i.e., spawning, breeding, feeding, or growth to maturity). Habitat Areas of Particular Concern (HAPCs) have also been designated within EFH areas; these include localized areas that are vulnerable to degradation or are especially important ecologically. The NMFS defines EFH for highly migratory species under its jurisdiction, while regional management councils define EFH for species under their jurisdiction. Federal fishery management plans (FMPs), and their amendments, provide a complete list of EFH potentially affected by activities at USAF installations. For the marine area surrounding CCAFS and PAFB, the South Atlantic Fishery Management Council (SAFMC) is the primary managing body. Additionally, some EFH designations by the Mid-Atlantic Fishery Management Council (MAFMC) and the Consolidated Atlantic Highly Migratory Species (HMS) Fishery Management Plan (FMP) extend into areas covered by this INRMP.

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The SAFMC currently manages EFH for several species including the South Atlantic snapper-grouper fishery; dolphin and wahoo fishery; South Atlantic shrimp; coastal migratory pelagic species; highly migratory species; spiny lobster; golden crab (*Chaceon fenneri*); coral, coral reefs, and live/hardbottom habitats; and sargassum (*Sargassum* spp.). Substrates designated as EFH and HAPC, include live/hard bottom, coral reefs, submerged aquatic vegetation (e.g., seagrasses), outcroppings around the shelf break zone, estuarine nursery areas, oyster reefs or shell banks, unconsolidated bottom (i.e., soft sediments), estuarine scrub/shrub (e.g., mangrove fringe), shelf current systems, sandy offshore shoals/bars, tidal creeks, coral, and coastal inlets. EFH and HAPC designated in the vicinity of PAFB and CCAFS are described below.

The "Comprehensive Amendment" was created for FMPs that were in place before the MSFCMA required the inclusion of EFH information in FMPs; the SAFMC amended seven FMPs in October 1998, and the Comprehensive Amendment became effective June 3, 1999 (SAFMC 1999).

5.3.1.1 Species with EFH in the Vicinity of CCAFS and PAFB

Snapper-Grouper Complex. EFH for snapper-grouper complex in the South Atlantic can be found from North Carolina to the eastern coast of Florida near Cape Canaveral (SAFMC 2010). EFH for snapper grouper species includes coral reefs, live/hardbottom, submerged aquatic vegetation, artificial reefs, and medium to high profile outcroppings on and around the shelf break zone from shore to at least 600 feet offshore. EFH includes the spawning area in the water column above the adult habitat and the additional pelagic environment, including sargassum, required for larval survival and growth, and the Gulf Stream as it provides a means to disperse snapper-grouper larvae (SAFMC 2010a). For estuarine-dependent life stages of the snapper grouper fishery, EFH within the in-shore (within 100-foot contour) includes: seagrass habitat; estuarine emergent wetland (saltmarsh, brackish marsh habitat); estuarine scrub/shrub wetland (mangrove); oyster reef and shellbank; soft sediments; artificial/coral reef; and live/hardbottom habitats.

The snapper grouper complex EFH-HAPCs include habitats that meet the criteria for each life stage of this fishery (egg, larval, post-larval, juvenile, and adult) and includes: medium to high profile offshore hard bottoms where spawning normally occurs; nearshore hard bottom areas; known or likely periodic spawning aggregations; mangrove habitat; oyster/shell habitat; seagrass habitat; all coastal inlets; pelagic and benthic sargassum, hermatypic coral habitat and reef; Oculina Bank HAPC; manganese outcroppings of Blake Plateau; Council-designated Artificial Reef Special Management Zones; and all state-designated nursery habitats of particular importance to snapper grouper. Florida aquatic preserves are state-designated nursery areas and are HAPCs under the snapper grouper fishery FMP. (SAFMC 2010a) Preserves most relevant to aquatic resources in proximity to installation areas covered by this INRMP include: Banana River Aquatic Preserve, Indian River-Malabar to Vero Beach Aquatic Preserve, Loxahatchee River-Lake Worth Creek Preserve, and Jensen Beach to Jupiter Inlet Aquatic Preserve (SAFMC 2010a). Deepwater marine protected areas (MPAs) are also an EFH-HAPC for the snapper grouper fishery (SAFMC 2011).

Dolphin Wahoo. The FMP for dolphin (*Coryphaena hippurus*) and wahoo (*Acanthocybium solandri*) is intended to manage and conserve dolphin and wahoo in waters off the Atlantic

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states (SAFMC 2004). EFH designated for dolphin and wahoo is the Gulf Stream, Florida Current, Charleston Gyre, and pelagic *Sargassum*. Charleston Gyre is located off the coast of South Carolina (SAFMC 2010b)

In Florida, dolphin wahoo EFH-HAPCs include the Islamorada Hump, Marathon Hump, The Ten-Fathom Ledge, The Point off Jupiter Inlet (Florida); the Point/Amberjack Lump, the Wall off the Florida Keys, and Pelagic Sargassum (SAFMC 2010b).

South Atlantic Shrimp. EFH for penaeid shrimp includes inshore estuarine nursery areas, offshore marine habitats used for spawning and growth to maturity, the Gulf Stream, and all interconnecting water bodies. Inshore nursery areas include tidal freshwater (palustrine), estuarine, and marine emergent wetlands (e.g., intertidal marshes); tidal palustrine forested areas; mangroves; tidal freshwater, estuarine, and marine submerged aquatic vegetation; and subtidal and intertidal non-vegetated flats. In addition, submerged aquatic vegetation is designated as EFH for postlarval/juvenile and subadult pink shrimp (*Farfantepenaeus duorarum*). (SAFMC 1999)

For rock shrimp, EFH consists of offshore terrigenous and biogenic sand bottom habitats from 60 to 600 feet in depth with highest concentrations occurring between 360 and 590 feet. EFH includes the shelf current systems near Cape Canaveral, and the Gulf Stream, both which provide major transport mechanisms affecting planktonic larval rock shrimp. These currents keep larvae on the Florida Shelf and may transport them inshore in spring. (SAFMC 1999) EFH for royal red shrimp include the upper regions of the continental slope from 590 feet to approximately 2,395 feet, with concentrations found at depths of between 820 feet and 1,558 feet over blue/black mud, sand, muddy sand, or white calcareous mud, and the Gulf Stream. (SAFMC 1999)

HAPCs for penaeid shrimp are designated as tidal inlets and state nursery and overwintering habitats (SAFMC 1999). Florida aquatic preserves are state-designated nursery areas and are HAPCs under the FMP for penaeid shrimp. Preserves most relevant to aquatic resources in proximity to installation areas covered by this INRMP include: Banana River Aquatic Preserve, Indian River-Malabar to Vero Beach Aquatic Preserve, Loxahatchee River-Lake Worth Creek Preserve, and Jensen Beach to Jupiter Inlet Aquatic Preserve.

Coastal Migratory Pelagic Species. The SAFMC managed species in the Coastal Migratory Pelagics Fishery Management Plan include cobia (*Rachycentron canadum*), little tunny (*Euthynnus alletteratus*), king mackerel (*Scomberomorus cavalla*), Spanish mackerel (*S. maculatus*), and cero (*Scomberomorus regalis*) (SAFMC 1999). EFH for coastal migratory pelagic species includes coastal inlets, sandy shoals of capes and offshore bars; high profile rocky bottom and barrier island ocean-side waters, and from the surf to the shelf break zone, and from the Gulf Stream shoreward, including *Sargassum* (SAFMC 1999).

EFH-HAPC located in-water off the coast of Florida in the vicinity of the 45 SW installations, CCAFS and PAFB, include The Point off Jupiter Inlet, *Phragmatopoma* (worm reefs) reefs off the central east coast of Florida; nearshore hardbottom south of Cape Canaveral; and

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sargassum habitat. In the Florida Keys, EFH-HAPC are The Hump off Islamorada; The Marathon Hump off Marathon; and The Wall off of the Florida Keys. (SAFMC 1999)

Highly Migratory Pelagic Species. Highly migratory pelagic species including the tuna (*Thunnus* spp.), billfish, sharks, and swordfish use pelagic habitats identified as EFH in the South Atlantic including the water column and/or attributes of the water column; this habitat is found off the coast of PAFB and CCAFS (SAFMC 2009a).

Spiny Lobster. EFH for spiny lobster includes nearshore shelf/oceanic waters; shallow subtidal bottom; seagrass habitat; unconsolidated bottom (soft sediments); coral and live/hard bottom habitat; sponges; algal communities; and mangrove habitat (prop roots). EFH for spiny lobster applies to coastal waters to the landward most influence of the tide from the Virginia/North Carolina border to the Dry Tortugas in the Florida Keys (SAFMC 2009b).

Golden Crab. EFH for golden crab includes the US continental shelf from Chesapeake Bay south through the Florida Straits (and into the Gulf of Mexico), and the Gulf Stream. EFH types for golden crab include: a flat foraminferan ooze habitat; distinct mounds, primarily of dead coral; ripple habitat; dunes; black pebble habitat; low outcrop; and soft-bioturbated habitat (SAFMC 1999).

Coral, Coral Reefs, and Live/Hardbottom Habitats. EFH for corals incorporates habitat for over 200 species. EFH for black corals includes rough, hard, exposed, stable substrates, located offshore in saline waters (30-35 parts per thousand [ppt]), and at depths not greater than 54 feet. For stony corals, EFH includes rough, hard, exposed, stable substrate in subtidal to outer shelf depths from Palm Beach County south through the Florida reef tract. Stony coral EFH can be further described as occurring in a subtropical clime (59-95°F), in subtidal oligotrophic waters to 98 feet deep, salinity ranging from 30 to 35 ppt with low turbidity for light penetration. For octocorals, EFH includes rough, hard, exposed, stable substrate from the subtidal to outer shelf depths with a wide range of salinity and light penetration. EFH for pennatulaceans includes muddy, silty bottoms from the subtidal to outer shelf depths, with a wide range of salinity, and light penetration. (SAFMC 2000)

EFH – HAPCs for corals occur along the Atlantic coast from North Carolina to Biscayne Bay in Florida, and also in the Florida Keys National Marine Sanctuary. HAPCs in the vicinity of the 45 SW installations are: The Phragmatopoma (worm reefs) reefs off the central east coast of Florida; Oculina Banks off the east coast of Florida from Ft. Pierce to Cape Canaveral; and nearshore (0-12 feet) hardbottom off the east coast of Florida from Cape Canaveral to Broward County. (SAFMC 2000)

Pelagic Sargassum. EFH for pelagic *Sargassum* sp. is designated as the top 10 meters of the water column in the South Atlantic Council's Exclusive Economic Zone (EEZ) bounded by the Gulf Stream (SAFMC 2012), and in state waters (SAFMC 2003).

5.3.1.2 Other EFH within the Vicinity of CCAFS and PAFB

A well-developed line of rock outcroppings running approximately 10 miles from PAFB is comprised of lithified coquina rock of the Pleistocene Anastasia Formation (Olsen 1989). The

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coquina rock provides a substrate for the sabellariid polychaete worm (*Phragmatopoma lapidosa*). These sabellariid worm reefs provide important functions of dissipating and absorbing wave energy, thus, giving the shoreline some protection against erosion, and providing habitat for marine organisms. These sabellariid worm rock reef and coquina rock/nearshore hard bottoms are protected as EFH (SAFMC 1999).

The Oculina Bank near Cape Canaveral also serves as a HAPC for ivory tree coral (*Oculina varicosa). Ivory tree coral* is a slow–growing, branchlike coral whose thickets provide spawning sites for numerous species of reef–dwelling fish, including groupers and snappers. *Oculina* reefs grow along the US continental shelf with concentrations occurring off the east–central coast of Florida. Limestone "pinnacles" lie at depths of approximately 850 feet off east–central Florida and extend more than 30 feet above the surrounding sea floor. This area, called the Oculina Bank, is located approximately 15 miles offshore Fort Pierce (Brooke et al. 2006). The Oculina Bank is considered HAPC for the ivory tree coral and snapper grouper complex species.

5.3.2 CCAFS

CCAFS is located on a barrier island that supports many plants, animals, and natural communities. Barrier islands along the Atlantic coast are especially important to nesting sea turtles, populations of small mammals, and as foraging and roosting habitat for a variety of resident and migratory birds. The majority of CCAFS consists of scrub habitat with small portions identified as maritime hammock and riverine hammock. CCAFS provides habitat for numerous bird species, both resident and migratory. A diverse array of species of wildlife inhabit, utilize and/or frequent CCAFS. Specifically, more than 25 mammalian species, more than 50 amphibian and reptile species, and more than 200 bird species are known to occur on or in the vicinity of CCAFS. A complete list of documented fish and wildlife species found on CCAFS can be found in **Appendix F**.

5.3.3 PAFB

Similar to CCAFS, PAFB is also located on a barrier island. Various wildlife species inhabit, utilize, or frequent PAFB. Specifically, 6 mammalian species, 8 amphibian and reptile species, and 46 bird species are known to occur on or in the vicinity of PAFB. A complete list of documented fish and wildlife species found on PAFB can be found in **Appendix F**.

5.3.4 MTA

MTA consists of 640 acres of forest, grassy fields, abandoned runways and numerous transmitter and support buildings. The FNAI conducted a comprehensive biotic survey of MTA for the 45 SW in October 1997. This survey was included rare, threatened, and endangered flora and fauna, migratory birds, and natural communities (Schultz and Knight 1997). Specifically, 18 mammalian species, 18 amphibian and reptile species, and 56 bird species are known to occur on or in the vicinity of MTA. Another flora and fauna study was recently conducted within the MTA in late 2013 and early 2014 (VZ Technology et al. 2014b), which included: a gopher tortoise/gopher tortoise burrow survey of 100% of the MTA installation area; an Audubon's crested caracara survey; a Florida scrub jay survey; wood stork survey; bat acoustic survey; fall biological survey; and spring biological survey. This recent study identified 15 mammalian species, 13 amphibian and reptile species, 45 bird species, and 2 fish species

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within MTA. The gopher tortoise survey documented 175 burrows and 63 gopher tortoises (*Gopherus polyphemus*). The Audubon's crested caracara (*Caracara cheriway*), Florida scrub jay (*Aphelocoma coerulescens*), bald eagle (*Haliaeetus leucocephalus*), wood stork (*Mycteria americana*) were not observed during the survey periods. Numerous bat species were identified during the bat acoustic survey. Numerous birds, mammals and frogs were also documented. A complete list of documented fish and wildlife species found on MTA can be found in **Appendix F**.

5.3.5 JDMTA

Fauna on JDMTA consists of wildlife normally associated with scrub communities, including raccoons, opossums, and occasionally a white-tailed deer. The federally threatened Florida Scrub-jay has been observed at JDMTA, but has never been observed nesting on the annex. While a migratory bird survey has included survey points at JDMTA, a comprehensive species survey has not been conducted for this installation. Consequently, a full species list is not available. Nevertheless, 51 bird species are known to occur on or in the vicinity of JDMTA. A complete list of documented bird species found on JDMTA can be found in **Appendix F**.

5.4 Threatened and Endangered Species and Species of Concern

Various vegetation and wildlife surveys conducted at 45 SW properties have documented several federally and state listed species. Priority species were identified by 45 SW based on their regulatory status and known occurrence at CCAFS, PAFB, MTA, and JDMTA. Management priority for each of these sensitive species was determined as follows:

- **High** priority species include federally listed species with management plans (see Appendix C), Biological Opinions (BO) and incidental take permits (see **Appendix B**), and/or which are directly managed by 45 SW with projects undertaken specific for them.
- **Medium** priority species include federally listed species known to occur on at least one of the 45 SW installations; however, these species are not typically directly managed by 45 SW nor are projects undertaken directly by 45 SW to support these species, although protection measures are often used to reduce potential impacts.
- **Low** priority species include all federal species of special concern as well as all state listed species known to occur on at least one of the 45 SW installations.

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While other special status species are known to occur in Brevard and Martin counties (**Table 5-5**), federally or state listed species that have not been documented on 45 SW properties have not been assigned a management priority. However, should these species be documented in the future a management priority would be assigned and appropriate management actions would be developed.

There are 10 high priority special status wildlife species, including 5 sea turtle species, identified for the 45 SW. In addition there are nine medium priority species identified for the 45 SW. These species include 5 birds, 1 fish, 1 reptile, 2 mammals, and 1 plant. The high priority and medium priority species for each installation are listed below. Details regarding management of priority special status species are included in **Section 7.5**. Additionally, a complete list of special status species with the potential to occur on 45 SW properties descriptions of the high and medium priority species can be found below (**Table 5-5**).

There are some priority species that do not occur or have not been documented on 45 SW properties, but the 45 SW is required to consult for potential impacts to these species (Table 5-5).

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Table 5-5. Special Status Species Occurring in Brevard and Martin Counties, Florida (page 1 of 5)

Common Name	Scientific Name	Federal Status (ESA)	State Status (FWC)	Climate Change Vulnerability Index (CCVI)	Management Priority	Known to Occur (Detected in Recent Surveys)			
						CCAFS	PAFB	MTA†	JDMTA
Terrestrial Wildlife Species									
Reptiles									
eastern indigo snake[c]	*Drymarchon couperi*	T	-	-	High	✓		✓	
gopher tortoise	*Gopherus polyphemus*	C	T	-	High	✓	✓	✓	✓
Florida pine snake	*Pituophis melanoleucus mugitus*	-	SSC	-	-	✓			
gopher frog	*Lithobates capito*	-	SSC	-	-	✓			
Birds									
Florida scrub-jay	*Aphelocoma coerulescens*	T	-	-	High	✓			✓
limpkin	*Aramus guarauna*	-	SSC	PS	-				
Florida burrowing owl	*Athene cunicularia floridana*	-	SSC	-	-		✓		
red knot[a]	*Calidris canutus rufa*	T	-	-	Medium	✓			
crested caracara	*Caracara cheriway*	T	-	-	-				
piping plover	*Charadrius melodus*	T	-	-	Medium	✓			
snowy plover[a]	*Charadrius nivosus*	-	T	-	-	✓			
little blue heron	*Egretta caerulea*	-	SSC	-	Low	✓	✓		
reddish egret	*Egretta rufescens*	-	SSC	-	Low	✓	✓		
snowy egret	*Egretta thula*	-	SSC	-	Low	✓	✓		
tricolored heron	*Egretta tricolor*	-	SSC	-	Low	✓	✓		
white ibis	*Eudocimus albus*	-	SSC	-	Low	✓	✓		
southeastern American kestrel	*Falco sparverius paulus*	-	T	-	Low	✓	✓	✓	
Florida sandhill crane	*Grus canadensis pratensis*	-	T	-	Low			✓	
American oystercatcher	*Haematopus palliatus*	-	SSC	-	Low	✓			
bald eagle	*Haliaeetus leucocephalus*	BGEPA	-	-	Medium	✓	✓	✓	
wood stork	*Mycteria americana*	T	-	-	Medium	✓	✓		
osprey	*Pandion haliaetus*	-	SSC	-	Low	✓	✓	✓	✓
brown pelican[a]	*Pelecanus occidentalis*	-	SSC	-	Low	✓	✓		
roseate spoonbill[a]	*Platalea ajaja*	-	SSC	-	Low	✓	✓		
Audubon's crested caracara	*Polyborus plancus audubonii*	T	-	-	-	✓			
black skimmer[a]	*Rynchops niger*	-	SSC	-	Low	✓	✓		
roseate tern[a]	*Sterna dougallii*	T		-	Medium	✓			
least tern[a]	*Sternula antillarum*	-	T	HV	Low	✓	✓		

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Table 5-5. Special Status Species Occurring in Brevard and Martin Counties, Florida (page 2 of 5)

Common Name	Scientific Name	Federal Status (ESA)	State Status (FWC)	Climate Change Vulnerability Index (CCVI)	Management Priority	Known to Occur (Detected in Recent Surveys)			
						CCAFS	PAFB	MTA†	JDMTA
Mammals									
southeastern beach mouse	*Peromyscus polionotus niveiventris*	T	-	-	High	✓			
Florida mouse	*Podomys floridanus*	-	SSC	PS	-				
Florida panther	*Puma concolor coryi*	E	-	-	-				
Sherman's fox squirrel	*Sciurus niger shermani*	-	SSC	-	-				
Aquatic Wildlife Species									
Fish									
Atlantic sturgeon[a]	*Acipenser oxyrinchus oxyrinchus*	PS:E,T	SSC	-	Medium	✓*	✓*		
striped croaker	*Bairdiella sanctaeluciae*	SC	-	-	-				
opossum pipefish	*Microphis brachyurus*	SC	-	-	-				
smalltooth sawfish[a]	*Pristis pectinata*	E	-	-	Medium	✓*	✓*		
mangrove rivulus	*Rivulus marmoratus*	SC	SSC	-	-				
Amphibians									
Carolina gopher frog	*Lithobates capito*	-	SSC	HV	-				
Reptiles									
American alligator	*Alligator mississippiensis*	SAT	-	-	Medium	✓	✓	✓	
loggerhead sea turtle	*Caretta caretta*	E, T	-	EV	High	✓	✓		
green sea turtle	*Chelonia mydas*	E	-	-	High	✓	✓		
leatherback sea turtle	*Dermochelys coriacea*	E	-	-	High	✓	✓		
hawksbill sea turtle	*Eretmochelys imbricata*	E	-	-	High	✓*	✓*		
Kemp's ridley sea turtle	*Lepidochelys kempii*	E	-	-	High	✓*	✓*		
alligator snapping turtle[a]	*Macrochelys temminckii*	-	SSC	-	-				
Mammals									
North Atlantic right whale	*Eubalaena glacialis*	E	-	-	Medium	✓*	✓*		
West Indian manatee	*Trichechus manatus*	E	-	-	Medium	✓*	✓*		
Plant Species									
sea lavender	*Argusia gnaphalodes*	-	E	-	-	✓			
four-petal pawpaw	*Asimina tetramera*	E	E	-	-				
Curtiss' sandgrass	*Calamovilfa curtissii*	-	T	-	-				
many-flowered grass-pink	*Calopogon multiflorus*	-	E	-	-				
sand butterfly pea	*Centrosema arenicola*	-	E	-	-				

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Table 5-5. Special Status Species Occurring in Brevard and Martin Counties, Florida (page 3 of 5)

Common Name	Scientific Name	Federal Status (ESA)	State Status (FWC)	Climate Change Vulnerability Index (CCVI)	Management Priority	Known to Occur (Detected in Recent Surveys)			
						CCAFS	PAFB	MTA†	JDMTA
sand-dune spurge	*Chamaesyce cumulicola*	-	E	-	-				
satin-leaf[a]	*Chyrsophyllum oliviforme*	-	T	-	Low	✓			
Florida perforate lichen	*Cladonia perforata*	E	E	-	High				✓
piedmont jointgrass	*Coelorachis tuberculosa*	-	T	-	-				
large-flowered rosemary	*Conradina grandiflora*	-	T	-	-				
Florida tree fern	*Ctenitis sloanei*	-	E	-	-				
hay scented fern	*Dennstaedtia bipinnata*	-	E	-	-				
Lakela's mint	*Dicerandra immaculata*	E	E	-	-				
titusville balm	*Dicerandra thinicola*	-	E	-	-				
tropical ironwood	*Eugenia confusa*	-	E	-	-				
coastal vervain	*Glandularia maritima*	-	E	-	Low	✓			
tampa vervain	*Glandularia tampensis*	-	E	-	-				
Johnson's seagrass	*Halophila johnsonii*	T	-	-	-				
simpson's prickly apple	*Harrisia simpsonii*	-	E	-	-				
beach jacquemontia	*Jacquemontia reclinata*	E	E	-	-				
Atlantic Coast Florida lantana	*Lantana depressa* var. *floridana*	-	E	-	Low	✓			
nodding pinweed	*Lechea cernua*	-	T	-	-				
pine pinweed	*Lechea divaricata*	-	E	-	-				
small's flax	*Linum carteri* var. *smallii*	-	E	-	-				
Simpson's stopper[b]	*Myrcianthes fragrans*	-	T	-	Low	✓			
celestial lily	*Nemastylis floridana*	-	E	-	-				
Florida beargrass	*Nolina atopocarpa*	-	T	-	-				
hand fern	*Cheiroglossa palmata*	-	E	-	Low			✓	
shell mound prickly-pear cactus[b]	*Opuntia stricta*	-	T	-	Low	✓	✓		
terrestrial peperomia	*Peperomia humilis*	-	E	-	-				
blunt-leaved peperomia	*Peperomia obtusifolia*	-	E	-	-				
tiny polygala	*Polygala smallii*	E	E	-	-				
giant orchid	*Pteroglossaspis ecristata*	-	T	-	-				
beach star[b]	*Remirea maritima*	-	E	-	Low	✓	✓		
sandyfield beaksedge[b]	*Rhynchospora megalocarpa*		E	-	Low	✓			
inkberry[b]	*Scaevola plumieri*	-	T	-	Low	✓	✓		

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Table 5-5. Special Status Species Occurring in Brevard and Martin Counties, Florida (page 4 of 5)

Common Name	Scientific Name	Federal Status (ESA)	State Status (FWC)	Climate Change Vulnerability Index (CCVI)	Management Priority	Known to Occur (Detected in Recent Surveys)			
						CCAFS	PAFB	MTA†	JDMTA
coastal hoary-pea	*Tephrosia angustissima* var. *curtissii*	-	E	-	-				
common wild-pine	*Tillandsia fasiculata*	-	E	-	Low	✓			
banded wild-pine	*Tillandsia flexuosa*	-	T	-	-				
dancing-lady orchid	*Tolumnia bahamensis*	-	E	-	-				
scentless vanilla	*Vanilla mexicana*	-	E	-	-				
redmargin zephyrlily	*Zephyranthes simpsonii*	-	T	-	-				

FEDERAL STATUS

Definitions derived from US ESA of 1973, Sec. 3.

E = Endangered = Species in danger of extinction throughout all or a significant portion of its range.

T = Threatened = Species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

C = Candidate = Species for which Federal listing agencies have sufficient information on biological vulnerability and threats to support proposing to list the species as Endangered or Threatened.

E, T = Species currently listed endangered in a portion of its range but only listed as threatened in other areas (federally threatened in Florida).

PS: E, T = This species has partial status (i.e., throughout a subset of its range) and is listed as endangered in a portion of its range but only listed as threatened in other. In Florida, the Atlantic sturgeon is endangered.

E, PDL = Species currently listed endangered but has been proposed for delisting.

E, PT = Species currently listed endangered but has been proposed for listing as threatened.

E, XN = Species currently listed endangered but tracked population is a non-essential experimental population.

SAT = Treated as threatened due to similarity of appearance to a species which is federally listed such that enforcement personnel have difficulty in attempting to differentiate between the listed and unlisted species.

SC = Not currently listed, but considered a “species of concern” to USFWS.

Definitions derived from Bald and Golden Eagle Protection Act.

BGEPA = Bald and Golden Eagle Protection Act = Species is federally protected under the Bald and Golden Eagle Protection Act

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Table 5-5. Special Status Species Occurring in Brevard and Martin Counties, Florida (page 5 of 5)

STATE STATUS

Wildlife: Definitions derived from "Florida's Endangered Species and Species of Special Concern, Official Lists" published by FWC, 1 August 1997, and subsequent updates.

T = Threatened = State population listed as Threatened by the FFWCC. Defined as a species, subspecies, or isolated population which is acutely vulnerable to environmental alteration, declining in number at a rapid rate, or whose range or habitat is decreasing in area at a rapid rate and as a consequence is destined or very likely to become an endangered species within the foreseeable future.

SSC = Species of Special Concern = Listed as Species of Special Concern by the FFWCC. Defined as a population that warrants special protection, recognition, or consideration because it has an inherent significant vulnerability to habitat modification, environmental alteration, human disturbance, or substantial human exploitation which, in the foreseeable future, may result in its becoming a threatened species.

Plants: Definitions derived from Sections 581.011 and 581.185(2), F.S., and the Preservation of Native Flora of Florida Act, 5B-40.001. FNAI does not track all state-regulated plant species; for a complete list of state-regulated plant species, call Florida Division of Plant Industry, 352-372-3505 or see: http://www.doacs.state.fl.us/pi/.

E = Endangered = Species of plants native to Florida that are in imminent danger of extinction within the state, the survival of which is unlikely if the causes of a decline in the number of plants continue; includes all species determined to be endangered or threatened pursuant to the US ESA.

T = Threatened = Species native to the state that are in rapid decline in the number of plants within the state, but which have not so decreased in number as to cause them to be endangered.

CLIMATE CHANGE VULNERABILITY INDEX

EV = Extremely Vulnerable = CCVI score above 10
HV = Highly Vulnerable = CCVI score ranging between 7 and 10
MV = Moderately Vulnerable = CCVI score ranging between 4 and 7
PS = Not Vulnerable/Presumed Stable = CCVI score ranging between -2 and 4
IL = Not Vulnerable/Increase Likely = CCVI score below -2

General Sources: FNAI 2014; Florida Department of Agricultural and Consumer Services 2014; USFWS 2014f; Dubois et al. 2011.

Site Specific Sources (CCAFS): Gulledge et al. 2009; Reyier et al. 2011; Reyier et al. 2010; Stolen and Oddy 2012; Fleming and Greenwade 2007; Hankla 2008.

Site Specific Sources (PAFB): Oddy et al. 1997; Fleming and Greenwade 2007; Hankla 2008.

Site Specific Sources (MTA): VZ Technologies, LLC et al. 2014b; USAF 2014a; Fleming and Greenwade 2007.

Site Specific Sources (JDMTA): Chambers 2013; Fleming and Greenwade 2007.

Notes: [a] Not documented by FNAI (2014) as occurring in either Brevard or Martin County, but documented as occurring on 45 SW properties by VZ Technologies, LLC et al. 2014b or USAF 2014a.

[b] Not documented by FNAI (2014) as occurring in either Brevard or Martin County, but documented in Gulledge et al. 2009.

[c] Eastern indigo snake is assumed to occur wherever gopher tortoise burrows are present. The indigo snake has been observed on CCAFS and MTA.

† For special status species "potential occurrence" see VZ Technologies, LLC et al. 2014b

✓* Species does not occur on 45 SW properties but occurs in water adjacent to and 45 SW is required to consult for potential impacts.

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5.4.1 CCAFS

FNAI conducted a comprehensive biological survey of CCAFS for the 45 SW (FNAI 1998). This two-year survey was completed in December 1997 and included rare, threatened, and endangered flora and fauna, migratory birds, and outstanding natural communities. Survey efforts at CCAFS since this time (Gulledge et al. 2009; Reyier et al. 2010; 2011; Stolen and Oddy 2012; Fleming and Greenwade 2007; Hankla 2008) have identified additional federally and state listed sensitive species occurring at the installation. Federally or state listed species occurring at CCAFS include 2 fish, 10 reptiles, 18 birds, 4 mammals, and 11 plants (Table 5-5). No federally designated critical habitat under Section 4 of the ESA is mapped on the installation; however, critical in-water habitat for West Indian manatees is mapped within the Banana River and along the Atlantic Coast (USFWS 2014f). Federally designated critical habitat for the North Atlantic right whale is also mapped along the Atlantic Coast (USFWS 2014f). USAF negotiated with USFWS to avoid critical habitat designation on land at CCAFS and PAFB for the loggerhead sea turtle (79 FR 39756, 39805[1]). This USFWS exemption was granted on 10 October 2012 (USFWS 2012). Sea turtle management actions taken by the 45 SW are beneficial to the species and meet the requirements for exemption from the critical habitat designation on land. The 45 SW is not exempt from the in-water critical habitat designation (by NMFS) for the loggerhead sea turtle since these waters are not owned by DoD. High priority and medium priority species for CCAFS are listed below. Management strategies for these species are discussed in **Section 7.5** and descriptions of the high and medium priority species can be found in **Appendix C**.

High Priority Species

- Federally threatened eastern indigo snake
- Federal candidate and state threatened gopher tortoise
- Federally threatened Florida scrub jay
- Federally threatened southeastern beach mouse (SEBM)
- Federally threatened loggerhead sea turtle
- Federally endangered green sea turtle
- Federally endangered leatherback sea turtle
- Federally endangered hawksbill sea turtle
- Federally endangered Kemp's ridley sea turtle

Medium Priority Species

- Federally threatened red knot

[1] *Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the NW Atlantic Ocean Distinct Population Segment of the Loggerhead Sea Turtle* can be found at: https://www.fws.gov/policy/library/2014/2014-15725.html

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- Federally threatened piping plover
- Federally protected bald eagle
- Federally threatened wood stork
- Federally threatened roseate tern
- Federally endangered Atlantic sturgeon
- Federally endangered smalltooth sawfish
- American alligator (treated as federally threatened)
- Federally endangered North Atlantic right whale
- Federally endangered West Indian manatee

5.4.2 PAFB

A comprehensive biological survey of PAFB was completed in December 1997 and included rare, threatened, and endangered flora and fauna, migratory birds, and outstanding natural communities (Oddy et al. 1997). Survey efforts at PAFB since this time (Fleming and Greenwade 2007, Hankla 2008) have identified additional federally and state listed sensitive species occurring at the installation. Federally or state listed species occurring at PAFB include 2 fish, 8 reptiles, 13 birds, 2 mammals, and 3 plants (Table 5-5). No federally designated critical habitat under Section 4 of the ESA is mapped on the installation; however, critical habitat for West Indian manatees is mapped within the Banana River and along the Atlantic Coast (USFWS 2014f). Similarly federally designated critical habitat for the North Atlantic right whale loggerhead sea turtle is mapped along the Atlantic Coast as well (USFWS 2014f). As discussed in Section 5.4.1, the 45 SW installations, CCAFS and PAFB, are exempt from critical habitat designation on land for the loggerhead sea turtle. This USFWS exemption was granted on 10 October 2012 (USFWS 2012). Sea turtle management actions taken by the 45 SW are beneficial to the species and meet the requirements for exemption from the critical habitat designation on land. The 45 SW is not exempt from the in-water critical habitat designation for the loggerhead sea turtle. High priority and medium priority species for PAFB are listed below. Management strategies for these species are discussed in **Section 7.5** and descriptions of the high and medium priority species can be found in **Appendix C**.

High Priority Species

- Federal candidate and state threatened gopher tortoise
- Federally threatened loggerhead sea turtle
- Federally endangered green sea turtle
- Federally endangered leatherback sea turtle
- Federally endangered hawksbill sea turtle
- Federally endangered Kemp's ridley sea turtle

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Medium Priority Species

- Federally protected bald eagle
- Federally threatened wood stork
- Federally endangered Atlantic sturgeon
- Federally endangered smalltooth sawfish
- American alligator (treated as federally threatened)
- Federally endangered North Atlantic right whale
- Federally endangered West Indian manatee

5.4.3 MTA

Recent biological surveys at MTA include a migratory bird study as well a comprehensive biological survey of MTA completed in 2014 (Fleming and Greenwade 2007; VZ Technologies, LLC, et al. 2014b). Federally or state listed species observed during these studies include 3 reptiles, 3 birds, and 1 plant. No federally designated critical habitat under Section 4 of the ESA is mapped on the installation (USFWS 2014f). High priority and medium priority species for MTA are listed below. Management strategies for these species are discussed in **Section 7.5** and descriptions of the high and medium priority species can be found in **Appendix C**.

High Priority Species

- Federally threatened eastern indigo snake
- Federal candidate and state threatened gopher tortoise

Medium Priority Species

- Federally threatened wood stork (due to location within USFWS Core Foraging Area)
- Federally protected bald eagle
- American alligator (treated as federally threatened)

On numerous visits to MTA by 45 CES/CEIE-C personnel, the wood stork has not been observed. During the recent bird survey (VZ Technologies, et al. 2014b), surveys were conducted over multiple seasons and the wood stork was not observed. Suitable habitat for the wood stork is negligible on MTA; however, MTA is located within two wood stork Core Foraging Areas as established by USFWS. Due to the federal threatened status of the species, and because MTA is located within two CFAs, the wood stork is identified by the 45 SW as a medium priority species.

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5.4.4 JDMTA

In November 1997, a survey was performed under Section 7 of the ESA to determine if federally and state endangered Florida perforate lichen was present on JDMTA. This survey documented two distinct populations within the boundaries of JDMTA; however, in 2005, these populations were relocated to facilitate a tower and fence replacement project. Only fragmented pieces too small to collect were left on JDMTA. Nevertheless, it is possible that the lichen may disperse back into JDMTA with wind and rain.

In addition to the federally and state listed Florida perforate lichen, two special status reptiles have been documented at JDMTA, and an additional migratory bird survey (Fleming and Greenwade 2007) documented one federally threatened bird. There is no formally designated critical habitat located on JDMTA (USFWS 2014f). Management strategies for these species are discussed in **Section 7.5** and descriptions of the high and medium priority species can be found in **Appendix C**.

High Priority Species

- Federally endangered Florida perforate lichen
- Federally threatened eastern indigo snake
- Federal candidate and state threatened gopher tortoise
- Federally threatened Florida scrub jay (foraging, caching)

5.5 Wetlands

Figure 5-5. Culvert in the ITL Area

Wetlands are an important natural system because of the diverse biological and hydrologic functions they perform. These functions may include water quality improvement, groundwater recharge, pollution treatment, nutrient cycling, the provision of wildlife habitat and niches for unique flora and fauna, storm water storage, and erosion protection. Wetlands are protected as a subset of the "waters of the US" under Section 404 of the Clean Water Act (CWA) and EO 11990 (Protection of Wetlands), which requires Federal agencies to take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the beneficial values of wetlands. The USACE defines wetlands as:

> "*…those areas that are inundated or saturated with ground or surface water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (33 Code of Federal Regulations [CFR] 328.3(b)).*"

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5.5.1 CCAFS

Figure 5-6. CCAFS Estuarine Wetlands

Jurisdictional wetlands have been identified by USACE on CCAFS for canals that directly connect with the Banana River up to the west side of Phillips Parkway; however, this identification is not an official jurisdictional determination as projects that may affect waters of the U.S. are reviewed by USACE on a case-by-case basis. However, there are a number of wetland habitats that occur on the installation including mangrove wetlands, salt marsh, and freshwater wetlands as well as manmade wetland habitats created by impoundments and borrow pits. Mangrove wetlands are located on the fringes of the Banana River and adjacent impoundments. Additionally, salt marsh wetlands occur throughout CCAFS amidst the intertidal shorelines. Freshwater wetlands are located throughout the installation in low-lying areas associated with topographic undulations and depressions.

Historically, freshwater wetlands were extensive at CCAFS and were primarily associated with the installation's prominent dune and swale topography. However, virtually all swales at CCAFS have been impacted at some point by roads, facilities, utility corridors, canals, or other disturbances. Drainage canals have significantly altered the hydrology of the interdunal wetlands on CCAFS. The extensive canal system on the installation has resulted in shorter, less frequent hydroperiods for swales. Wetland drainage in conjunction with a long history of fire suppression has resulted in encroachment into wetlands by native and invasive exotic woody plants, not normally a component of pristine interdunal swales.

The majority of estuarine wetlands on CCAFS have been degraded primarily by the construction of mosquito control structures. The construction of facilities, causeways, and utility corridors has also contributed to the degradation of wetlands. These activities have fragmented and isolated wetlands, resulting in significant degradation of hydrology and wetland function. Wetland areas impacted by mosquito impoundments have suffered from interrupted hydrologic connection with the Banana River. Hydroperiod, salinity, and vegetation species composition have changed dramatically since mosquito impoundments were installed.

According to the National Wetlands Inventory (NWI) the predominant wetland habitats at the installation include palustrine and estuarine wetlands (USFWS 2014g). Palustrine wetlands include inland systems like marshes and swamps as well as bogs, fens. Estuarine systems are found where salt and fresh waters mix with river systems having open, restricted, or sporadic connection to the open ocean with tidal influences near the connection points.

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Table 5-6. National Wetland Inventory Wetlands at CCAFS

Map Symbol	Size (acres)	Description
E1AB3L	0.23	Estuarine and Marine Deepwater
E1AB3M	0.02	
E1ABL	0.00	
E1UBL	17.81	
E1UBL6x	2.28	
E1UBLx	166.22	
E1UBL6	38.85	
M1UBL	27.38	
E2EM1/SS3P6	1.61	Estuarine and Marine Wetland
E2SS3N	26.87	
E2SS3/EM1P6	0.02	
E2EM1N	10.69	
E2EM1N6	19.23	
E2EM1P	2.89	
E2EM1P6	6.71	
E2SS3P	100.80	
E2SS3P6	146.40	
E2SS3Pd	29.66	
E2USM	0.01	
E2USN	< 0.01	
E2USP6	1.51	
M2USN	83.83	
M2USP	155.54	
PEM1/SS1F	1.76	Palustrine Freshwater Emergent Wetland
PEM1/SS1C	6.98	
PEM1C	128.99	
PEM1Cd	12.28	
PEM1F	50.44	
PEM1Fx	8.57	
PEM1T	29.10	
PEM1R	33.16	
PSS3F	1.59	Palustrine Freshwater Forested/Shrub Wetland
PSS1C	31.42	
PSS1R	21.84	
PSS3/EM1C	444.40	
PSS3/EM1Cd	30.11	
PSS3/EM1T	37.43	
PSS3C	38.95	
PSS3Cd	43.80	
PSS3R	88.71	
PUBHx	45.21	Palustrine Freshwater Pond
PUBV	20.60	
L1UBVx	31.04	Lake
L1UBV	26.26	

Source: USFWS 2014g; Cowardin et al. 1979

Notes: Map symbols (i.e., Cowardin classification codes) can be interpreted at http://www.fws.gov/wetlands/Data/Wetland-Codes.html.

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In addition to NWI mapping at CCAFS, the FNAI delineated and evaluated the remaining hammocks on CCAFS. The survey identified the following wetlands: 75 acres of basin marsh, and 140 acres of coastal interdunal swale; and uplands: approximately 2,290 acres of maritime hammock, 115 acres of tropical hammock, and 30 acres of hydric hammock, (Gulledge et al. 2009).

5.5.2 PAFB

Limited wetland habitats on PAFB are concentrated along the coast and include estuarine and marine wetlands. The NWI data indicates some surface water features on PAFB, which are primarily excavated canals used for storm water drainage. However, the NWI data and a wetland survey in the 1990s both indicated no natural upland wetlands, only wetlands associated with the Banana River. USACE jurisdictional wetland delineation was later conducted in June 2006 that only included waterways that had a direct connection with the Banana River. Isolated upland wetlands do exist on PAFB, but are identified on a case by case basis with delineations through SJRWMD based on potential project site boundaries and permitting requirements.

Table 5-7. National Wetland Inventory Wetlands at PAFB

Map Symbol	Size (acres)	Description
E1UBL	2.10	Estuarine and Marine Deepwater
E1UBLx	41.53	
E1ABL	2.45	
M2USP	12.05	Estuarine and Marine Wetland
PFO4Cd	3.17	Paulstrine Freshwater Forested/Shrub Wetland
PSS1Cd	32.95	
PAB4Hx	1.36	Palustrine Freshwater Pond
PUBHx	31.54	
R2UBHx	1.86	Riverine

Source: USFWS 2014g; Cowardin et al. 1979

Notes: Map symbols (i.e., Cowardin classification codes) can be interpreted at http://www.fws.gov/wetlands/Data/Wetland-Codes.html

5.5.3 MTA

The primary surface water resources at MTA are the three drainage canals within the property boundary, which drain into the Melbourne-Tillman Canal. The Melbourne-Tillman Canal is considered a surface water of the State of Florida and jurisdictional waters of the US by USACE. MTA wetlands and surface waters with a connection to the Melbourne-Tillman Canal are also considered jurisdictional waters of the US by USACE.

Table 5-8. National Wetland Inventory Wetlands at MTA

Map Symbol	Size (acres)	Description
R2UBHx	3.03	Riverine

Source: USFWS 2014g; Cowardin et al. 1979

NWI maps do not indicate the presence of wetlands on MTA. However, Schultz and Knight (1997) identified general wet area boundaries (including canals, ditches, and swales with

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wetland plant species) at MTA in August 1996. Further, SJRWMD has determined there are approximately 83 acres of mesic flatwoods in the southeast corner of the annex. This vegetation community is associated with hydric soils.

The natural wetland communities currently found on MTA are small remnants fragmented by human disturbances. The natural wetlands consist of depression marsh and wet flatwoods with scattered slash pine (*Pinus elliottii*) in the canopy. Depression marsh occurs as small discontinuous areas in the northwest portion of MTA along the north border. These marshes form a mosaic in the prevalent mesic flatwoods. Dominant species growing in this area include sandweed (*Hypericum fasciculatum*), maidencane (*Panicum hemitomon*), common pipewort (*Eriocaulon decangulare*), arrowhead (*Sagittaria lancifolia*), redroot (*Lachnanthes caroliniana*), beakrush (*Rhynchospora inundata*), and Virginia chain-fern (*Woodwardia virginica*). Additionally, a few shrubs of buttonbush and small trees of blackgum are also present. A smaller depression marsh occurs west of the runways near the middle of the installation. Dominant species in this are fireflag *(Thalia geniculata*), sand cordgrass (*Spartina bakeri*), arrowhead, redroot, and beakrush. Several other depression marshes are located in the southeast corner of the installation within a wet flatwoods matrix. Dominant species here are similar to those at the north end with one small localized population of sawgrass (*Cladium jamaicense*). The herbaceous species in the wet flatwoods include spikerush (*Eleocharis* spp.), common carpetgrass (*Axonopus affinis*), centella (*Centella asiatica*), and St. Johns wort (Schultz and Knight 1997).

The three canals on MTA are filled with vegetation, primarily common cattail (*Typha latifolia*), primrose willow (*Ludwigia peruviana*), Carolina willow (*Salix caroliniana*), arrowhead, maidencane, and marsh pennywort (*Hydrocotyle umbellata*). The narrower and shallower ditches are dominated by pickerelweed (*Pontederia cordata*), arrowhead, blue hyssop (*Bacopa caroliniana*), maidencane, and torpedo grass (*Panicum repens*). The more numerous swales are even shallower and vary from having many to no wetland plant species. The wet swales have a longer hydroperiod and generally have some of the following species including blue hyssop, water hyssop (*Bacopa monnieri*), rush (*Juncus* spp), spikerush, water primrose (*Ludwigia repens*), buttonweed (*Diodia virginiana*), and marsh pennywort. The swales in dry areas are frequently mowed and often dominated by bahia grass (*Paspalum notatum*) (Schultz and Knight 1997).

5.5.4 JDMTA

Unlike the 45 SW installations in Brevard County, no wetlands, canals, or surface waters are located on JDMTA.

5.6 Other Natural Resource Information

The 45 SW undertakes numerous studies and management actions that benefit natural resources. In conjunction with the management of the 45 SW natural resources; these studies and actions ensure the 45 SW successfully conserves its diverse biological resources while supporting the 45 SW mission.

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5.6.1 Surveys at 45 SW Properties

5.6.1.1 CCAFS

Recent biological surveys or monitoring conducted at CCAFS include the following listed in **Table 5-9**.

Table 5-9. Biological Surveys and Monitoring Conducted at CCAFS

Survey/Report Title	Author(s)	Year(s)
Fish		
Behavioral Response of Reef Fish to Pile Driving	Lafrate et al.	2013
Response of Coastal Sportfish to Pile Driving Activities in the Trident Submarine Basin, Port Canaveral, Florida	Reyier et al.	2010
Amphibians		
From the Mountains to the Prairies Seasonal *Batrachochytrium dendrobatidis* (*Bd*) Responses Differ by Latitude and Longitude at a Continental Scale	Petersen et al.	2013
Reptiles		
Gopher Tortoise Candidate Conservation Agreement (CCA) Annual Assessment Report	Chambers	2014, 2013, 2012, 2010, 2009
Birds		
Resident & Migratory Bird Survey, Phase I	Fleming and Greenwade	2007
Resident & Migratory Bird Survey, Phase II	SpecPro	2009
Mammals		
Report on SEBM Habitat Occupancy Survey on CCAFS	Stolen and Oddy	2013, 2012, 2011, 2010
Demography, Occupancy, and Homerange of the SEBM on the CCAFS	Oddy et al.	2012
Vegetation		
Coastal Maritime Hammock Evaluation and Delineation, CCAFS	Gulledge et al.	2009
Wetlands		
No surveys completed		
General Biological Surveys		
A Characterization of Biological Resources within the CCAFS Trident Submarine Basin, and Adjacent Marine Waters of Port Canaveral, Florida	Reyier et al.	2010
A Floral and Faunal Survey of Fresh and Brackish Water Habitats of CCAFS	Reyier et al.	2010

5.6.1.2 PAFB

Recent biological surveys or monitoring conducted at PAFB include the following listed in **Table 5-10**.

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Table 5-10. Biological Surveys and Monitoring Conducted at PAFB

Survey/Report Title	Author(s)	Year(s)
Fish		
No surveys completed		
Amphibians		
No surveys completed		
Reptiles		
Gopher Tortoise CCA Annual Assessment Report	Chambers	2014, 2013, 2012, 2010, 2009
Birds		
Resident & Migratory Bird Survey, Phase I	Fleming and Greenwade	2007
Resident & Migratory Bird Survey, Phase II	SpecPro	2009
Mammals		
No surveys completed		
Vegetation		
No surveys completed		
Wetlands		
No surveys completed		
General Biological Surveys		
T&E Species Survey for PAFB, Florida	Oddy et al.	1997

5.6.1.3 MTA

Recent biological surveys or monitoring conducted at MTA include the following listed in **Table 5-11**.

Table 5-11. Biological Surveys and Monitoring Conducted at MTA

Survey/Report Title	Author(s)	Year(s)
Fish		
No surveys completed		
Amphibians		
No surveys completed		
Reptiles		
Gopher Tortoise CCA Annual Assessment Report	Chambers	2014, 2013, 2012, 2010, 2009
Gopher Tortoise Survey at MTA	VZ Technologies LLC, Inc.	2013
Birds		
Resident & Migratory Bird Survey, Phase I	Fleming and Greenwade	2007
Resident & Migratory Bird Survey, Phase II	SpecPro	2009
Mammals		
MTA Bat Acoustic Survey	VZ Technologies, LLC, Inc.	2013
Vegetation		
No surveys completed		
Wetlands		
No surveys completed		
General Biological Surveys		
MTA Baseline Biological Survey	VZ Technologies, LLC, Inc.	2014

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Survey/Report Title	Author(s)	Year(s)
Survey of Natural Communities, Rare Plants, and Rare Vertebrates at MTA	Schultz and Knight	1997

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2 **5.6.1.4 JDMTA**

3 Recent biological surveys or monitoring conducted at JDMTA include the following listed in
4 **Table 5-12**.

5 **Table 5-12. Biological Surveys and Monitoring Conducted at JDMTA**

Survey/Report Title	Author(s)	Year(s)
Fish		
No surveys completed		
Amphibians		
No surveys completed		
Reptiles		
Gopher Tortoise CCA Annual Assessment Report	Chambers	2014, 2013, 2012, 2010, 2009
Birds		
Resident & Migratory Bird Survey, Phase I	Fleming and Greenwade	2007
Resident & Migratory Bird Survey, Phase II	SpecPro	2009
Mammals		
No surveys completed		
Vegetation		
Management Recommendations for *Cladonia perforata* at JDMTA, USAF, 45 SW	Yahr	2004
Wetlands		
No surveys completed		
General Biological Surveys		
No surveys completed		

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Chapter 6. Mission Impacts on Natural Resources

The 45 SW is responsible for overseeing the preparation and launching of US Government, civilian, and commercial satellites from CCAFS and to operate the ER for the AFSPC. The 45 SW also provides launch facilities and services to support the NASA and commercial space operations and support the US Navy's NOTU for missile tests and submarine operations. Many personnel, activities and facilities support this mission at the 45 SW. The 45 SW utilizes the EIAP established by the USAF under the NEPA to determine if proposed actions at the 45 SW will impact the environment. See **Section 3.3** for more on the mission, **Section 3.3** for more on the users, and **Section 2.3.2** for more on the NEPA process.

Natural resources support the military mission; however, they also have the potential to serve as a constraint. Mission impacts to natural resources must be minimized IAW compliance requirements as well as stewardship responsibilities.

6.1 Land Use

6.1.1 CCAFS

CCAFS includes approximately 16,198 acres that support multiple land use types (USAF 2013a). Land use for CCAFS was re-established based on new launch complex development criteria (and corresponding safety perimeters) as described in the Long Term Development Plan (USAF 2013a). The categories used for the preparation of the land use plans are identified in the 45 SW CCAFS General Plan (USAF 2013a) and are reflected in **Table 6-1**.

Table 6-1. Existing Land Use at CCAFS

Land Use Type	Acres
Administrative	26.0
Airfield Operations	558.8
Conservation	1,378.2
Fuel Munitions & Commodity Storage	346.5
Launch	419.7
Launch Support	456.0
Open Space	12,028.7
Public Outreach	65.2
Seaport Operations	117.4
Shop/Lab/Maintenance/Industrial/Warehouse	773.3
Total	**16,170**

Sources: USAF 2013a (CCAFS General Plan).
Notes: Land use acreage is based on GIS and may not accurately reflect real property.

Some of the land uses within CCAFS include open fields, airfield/skid strip, launch complexes, supporting infrastructure, and areas of native habitat, including scrub habitat and coastal dunes. Several launch complexes lie just inland of the beach dune community on CCAFS, but the majority of complexes are not active, and are abandoned in place. Open space includes areas managed for natural resources and is the largest land use category at CCAFS. However, lands used as buffers, for security or otherwise, are also included in the open space category.

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6.1.2 PAFB

PAFB includes approximately 2,002 acres that support multiple land use types (**Table 6-2**). The land use categories reflected in Table 6-2 are identified in the 45 SW PAFB General Plan (USAF 2011).The grounds at PAFB consist of all land and water acreage for which the 45 SW Commander (45 SW/CC) has responsibility (including outlying and satellite areas).

Table 6-2. Existing Land Use at PAFB

Land Use Type	Acres
Administrative (a)	100.9
Airfield Operations	205.3
Airfield Support	530.5
Community Service/Support	107.4
Fuel Munitions & Commodity Storage	23.0
Housing	181.0
Open Space (a)	347.4
Recreation	263.1
Security/Entry Gate	7.3
Shop/Lab/Maintenance/Industrial/Warehouse	175.9
Total	**1,942**

Sources: USAF 2011 (PAFB General Plan)
(a)Administrative and Open Space land use acreage updated 07 Oct 2014 (Baie 2014).
Notes: Land use acreage is based on GIS and may not accurately reflect real property.

The physiographic conditions at PAFB are similar to those described for CCAFS. PAFB is primarily developed land, but includes some coastal dune and estuarine habitat.

The 387-acre airfield dominates the land use at PAFB. There are two active runways on PAFB. The primary runway is 9,000 feet long and 260 feet wide, with 3,000 x 3,000 foot clear zones on each end. It is a Class B runway primarily intended for high performance and large, heavy aircraft. The secondary runway crosses northwest to southeast, and is 4,000 feet long and 200 feet wide. The clear zone for this runway is 1,000 feet in width by 3,000 feet in length. This runway is a Class A runway primarily intended for small, light aircraft.

Administrative facilities, including 45 SW command facilities, account for 75.9 acres and are concentrated in the cantonment area (i.e., main base). Smaller commercial, community services, unaccompanied housing, and industrial facilities are also concentrated in this area just north of the airfield. Another large administrative parcel is located on the southeastern quadrant of the base. The Community Center, including the Commissary, Base Exchange, and Medical Clinic, is located on the southern edge of PAFB. Outdoor recreation areas include the golf course and marina in the southwest, family camping and picnic areas along the Banana River, and four designated recreation areas on the Atlantic Ocean. Family housing is divided into two distinct neighborhoods: North and Central Housing.

6.1.3 MTA

MTA includes approximately 640 acres of mesic and wet flatwoods, grassy fields, abandoned runways, support buildings, transmitter antennas, and military training areas (**Table 6-3**) (USAF 2004).

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Table 6-3. Existing Land Use at MTA

Land Use Type	Acres
Administrative	14.5
Airfield Operations (Abandoned)	42.5
Open Space	543.3
Shop/Lab/Maintenance/Industrial/Warehouse	27.5
Total	**620**

Sources: USAF GIS data 2013.
Notes: Land use acreage is based on GIS and may not accurately reflect real property.

Administrative land consists of land occupied by buildings consists of 42.5 acres. Numerous pavement, electrical power transmission lines, and spoil areas cover approximately 27.5 acres at the MTA. Open space at MTA comprises approximately 543.3 acres and includes cabbage palm hammock, hydric pine flatwoods, mixed upland nonforested areas, pine flatwoods, streams and waterways, and disturbed lands.

6.1.4 JDMTA

JDMTA land area includes approximately 11 acres that support multiple land use types (**Table 6-4**). JDMTA includes developed land and scrub vegetation (USAF 2004).

Table 6-4. Existing Land Use at JDMTA

Land Use Type	Acres
Communications	11
Total	**11**

Sources: FNAI 2014.
Notes: Land use is based on the Florida Land Use, Cover, and Forms Classification System (FLUCCS).

Approximately nine acres are used for towers, antenna, and support facilities, while the remaining two acres are open space. A chain link fence topped with barbed wire surrounds the entire facility. A security clear zone of between 10 and 30 feet wide is maintained around much of the inner portion of the perimeter fence. The 45 SW also owns 10 to 50 feet outside of the perimeter fence, allowing for a buffer area within the project boundary and outside of the perimeter fence.

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6.2 Current Activities with Potential to Impact 45 SW Natural Resources

The primary activities that have the potential to impact the natural resources at the 45 SW installations include:

- Land clearing;
- Construction activity;
- Launch operations;
- Airfield operations;
- Training activities;
- Exterior lighting;
- Surface water and groundwater discharges;
- Hazardous waste and hazardous materials; and
- Environmental Restoration Program (ERP).[2]

6.2.1 Land Clearing

The 45 SW has developed innovative land clearing techniques that incorporate natural resource management activities into mission-required land clearing operations. Periodic land clearing at CCAFS is required to maintain lines of sight, utility corridors, firebreaks, canals, and security clear zones. Land clearing is also necessary for the management of numerous natural resources and invasive species management.

Figure 6-1. Mechanical Land Clearing

The 45 SW has completed a programmatic EA for land clearing activities (USAF 2005) that details the approved land clearing methods, maintenance activities, impacts to the natural resources, and the benefits associated with this method of land clearing.

Studies shows that scrub-jays prefer a scrub height of five feet with open, sandy (bare) ground interspersed through the landscape. The clearing specifications detailed in the programmatic EA attempt to create scrub habitat that mimics suitable habitat conditions for the numerous scrub-dependent wildlife species, while at the same time meeting mission requirements. The USFWS has approved the land clearing techniques contained in the EA and determined that these techniques will create and maintain suitable scrub habitat. Consultation is not required for

[2] The ERP was formerly known as the Installation Restoration Program (IRP).

routine land clearing that is conducted IAW the EA. However, consultation is required for land clearing associated with construction projects and other non-routine clearing operations.

Personnel of the 45 SW Civil Engineer Squadron Environmental Conservation Element (45 CES/CEIE-C) review all land clearing operations, and coordinate with the project proponent to ensure that the requirements contained in the land clearing policy, the invasive species policy, and the landscape management plan are incorporated into the land clearing operations.

Certain areas at CCAFS that require land clearing contain wetlands. The primary method of preventing adverse impacts to wetlands is avoidance. However, vegetation in wetlands that must be removed to support the mission will be hand cleared to minimize the impacts to the wetlands.

6.2.2 Construction Activity

The modification of existing facilities or the development of new facilities at the 45 SW properties has the potential to impact natural resources at the installations. Construction of new facilities and expansion of existing facilities within 45 SW properties are periodically needed to meet mission requirements. At CCAFS it is possible that construction activities may impact previously undeveloped areas and wildlife. All construction activity is reviewed under the EIAP procedures and efforts are made to minimize impacts to natural resources. Construction at PAFB is unlikely to impact the base's natural resources since PAFB is primarily composed of developed land. MTA may have some small construction projects, but high impact 45 SW development has not been proposed for MTA. Future construction activity at JDMTA will be limited due to the small size of the installation.

During an informal review in 1999 between USFWS and USAF, USFWS stated that all habitat on CCAFS is potential "scrub" and is considered scrub habitat that must be compensated for if lost/developed. Because of this, the USAF has adopted a policy that was agreed upon by USFWS for a 2 to 1 compensation rate for scrub lost to development (2011 BO). The project proponent will be responsible for mitigation and mitigation costs. Additional details on how and where to undertake compensatory restoration is described in the Scrub Habitat Restoration Plan (**Attachment C-3, Appendix C**). During the past 5 to 10 years, construction and other land clearing activities have resulted in the removal of approximately 300 acres of scrub or potential scrub. Most of this clearing was associated with expansion of airfield clear zones. However, destruction or disturbance of scrub is minimized through proper site planning, thoughtful construction practices, and adherence to the 45 SW land clearing policies. Unavoidable scrub loss will be offset (mitigated) through scrub compensation measures currently in place on CCAFS. See **Attachment C-3 of Appendix C**, Scrub Habitat Operational Management Plan.

In compliance with the ESA, the USAF will informally consult with the USFWS for all projects located in scrub habitat or other actions that have the potential to impact endangered species within 45 SW properties. If through the informal consultation process it is determined that an action is likely to adversely impact Scrub-jays or other listed wildlife, the USAF (or project proponent) will prepare a Biological Assessment (BA) addressing potential impacts, and enter into Formal Consultation with the USFWS.

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In addition to the consultation process outlined above, the USAF (or project proponent) will complete EIAP for all proposed construction activity. During EIAP, all environmental impacts are documented and alternatives to the proposed action are generated in order to minimize impacts to the natural resources of CCAFS, and at the other 45 SW properties.

Construction noise is not expected to have any significant long-term impact on wildlife, as it is short-term and temporary.

6.2.3 Launch Operations

Launches of space launch vehicles from CCAFS have potential environmental impacts. The environmental launch effects could occur directly from launches or indirectly from habitat alterations. Launch effects are relatively infrequent with launches occurring roughly 15 times per year (NASA 2011). Any effects from launch noise should be temporary and short-term; however, they are likely the primary source of noise at CCAFS. Launch noise includes noise resulting from ignition of launch vehicle engines as well as sonic booms produced as launch vehicles reach supersonic speeds. Typical launch trajectories from CCAFS result in sonic booms occurring to the east of CCAFS produced at high altitudes over the Atlantic Ocean. The highest recorded noise levels at CCAFS were those produced by launches of the Space Shuttle, which in the launch vicinity can exceed 160 decibels (NASA 2011).

Birds, reptiles, and small mammals would be most at risk from impacts due to a launch accident. Potential fires could result in temporary loss of habitat and mortality for species that do not leave the area. An accident on the launch pad would frighten nearby sensitive animal species that use the Indian and Banana Rivers (such as birds in rookeries and neo-tropical land birds). Aquatic T&E species, such as manatees and sea turtles, would not be expected to be adversely affected by a launch accident (NASA 2011).

Effects of launches from CCAFS on local vegetation has been mapped in the past (Schmalzer 1998). Vegetation scorching has been limited to small areas (less than 2.5 acres) within 495 feet of the launch pad. Acid and particulate deposition can extend some distance from the launch pad and can potentially impact larger areas, depending on the type of launch. No discernible vegetation or other environmental damage appears to be caused by this particulate deposition (Schmalzer 1998). Debris from launch failures has the potential to adversely affect managed fish species and their habitats. There are over 200 fish species that inhabit the waters in the vicinity of CCAFS that are managed by regional management councils. While localized fish kills occurred after most Space Shuttle launches as a direct result of surface water acidification, the majority of launches have not produced substantial acidification and have resulted in no recorded fish kills (NASA 2011). No animal mortality has been observed at CCAFS that could be attributed to the smaller launches (Schmalzer 1998). The fence at SLC 37 has been known to blow out during certain launches, resulting in fence material landing in adjacent vegetation as well as on the beach. Land managers have processes in place to ensure removal of this material is prompt and is completed in a manner that does not result in adverse impacts to species or habitat.

Florida scrub jays and southeastern beach mice occur in the vicinity of launch facilities at CCAFS. A small potential exists that individuals of these species would be directly impacted by

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launch operations. Previous environmental analyses concluded that impacts on these species are expected to be minimal. The behavior of scrub jays observed after launches has been normal, indicating no noise-related effects (Schmalzer 1998). Exterior lighting at CCAFS launch sites has the potential to impact nesting sea turtles and hatchlings. Artificial lighting on or near the beach has been documented to cause disorientation (loss of bearings) of hatchling and adult sea turtles (Witherington and Martin 1996), with often fatal results. The 45 SW takes an aggressive approach to minimize the impact of lighting to sea turtles; see **Section 6.2.6** Exterior Lighting, for additional information.

6.2.4 Airfield Operations

An Air Installation Compatible Use Zone (AICUZ) study was prepared for PAFB in 1979, and subsequently updated in 1993 and 2001 (USAF 2001). The goal of the USAF AICUZ program is to promote compatible land development in areas subject to potential aircraft accidents and noise. The AICUZ study characterized noise patterns and identified two off-base zones at PAFB where development should be restricted for reasons of public health (noise) and safety (accident potential). These two zones are Tortoise Island and Merritt Island. The majority of the noise occurs on base with reduced levels over the Atlantic Ocean or Banana River depending on flight paths. This study did not evaluate impacts to wildlife from aircraft noise. Use of the airfield generally results in minor and temporary noise that does not result in long-term impacts to wildlife. Use of the skid strip at CCAFS will generate temporary and minor noise there and are unlikely to substantially impact wildlife (USAF 2009b).

In addition to impacts from airfield-related noise, there are direct impacts to wildlife from aircraft strikes and from airfield management. 45 SW has a well-documented historical database of bird strikes and bird activity on and around the airfield. Bird strike potential is broken down into two phases with Phase II (between 1 October and 31 March) having the highest potential.

The PAFB airfield is situated on a narrow portion of land between the Banana River and Atlantic Ocean, and is located in an area of significant bird diversity and activity. The installation is home to year-round resident bird species and at a biological crossroads of north-south bird migration patterns. Birds of particular concern at PAFB include: gulls (ring-billed and herring), cattle egrets, little blue herons, great blue herons, pelicans, coots, willets, yellow legs, killdeer, plover, black skimmers, osprey and kestrel. In addition, approximately 20,000 lesser scaup (bluebill) winter on the Banana River near PAFB. Gulls (>50%), cattle egrets (~14%) pigeons and doves (~11%), and raptors (~10%) encompass over 85% of all BASH incidents at PAFB. However, it should be noted that over 70 bird species have been documented on the airfield during BASH surveys (USAF 2010).

Resident waterfowl are the greatest hazard to CCAFS Skid Strip flight operations. Other hazards include gulls and terns, particularly after heavy rain showers on the ramp and runway; long-legged wading birds along the Banana River and on the final approach to runway 13; raptors in all areas, particularly north of the runway; pelicans and shorebirds on final approach to both runways. Due to the limited air traffic flow on the CCAFS Skid Strip, there have been few recorded BASH incidents (USAF 2010).

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While impacts to birds are most common, rodent carcasses have been noted on runways, taxiways or in their immediate vicinity. A few bats have been documented in aircraft strike reporting on the PAFB airfield as well. 45 SW holds a USFWS depredation permit to allow for removal of nuisance birds causing elevated aircraft/pilot safety concerns only after all non-lethal methods fail to relocate the birds out of hazard zones. Depredations have been required over the years with fluctuations from zero to over a hundred annually. See Appendix B, Cooperative Agreements, Permits, and Biological Opinions for a copy of the depredation permit issued by USFWS, and for additional information.

6.2.5 Training Activities

Training exercises are periodically conducted at the 45 SW and have the potential to impact natural resources. Training exercises are required to prepare military personnel for a variety of military activities and to prepare 45 SW personnel for onsite emergency situations such as fires and hazardous materials spills. The climate and tropical conditions at the 45 SW installations provide unique conditions often necessary for training and testing activities.

All proposed training activities are coordinated with 45 CES/CEIE-C personnel in order to minimize impacts to sensitive environmental areas at the 45 SW. Prior to the initiation of training activities 45 CES/CEIE-C will do the following when appropriate:

- Identify sensitive habitats and mating periods for protected species and migratory birds;
- Prohibit access to known protected species locations;
- Restrict training activities during nesting season;
- Consult with appropriate regulatory agencies;
- Take actions to minimize the dispersion of invasive species;
- Minimize impacts to wetlands;
- Require the installation of erosion and sediment control measures; and
- Other actions deemed necessary based on the scope of the training exercise.

6.2.6 Exterior Lighting

Exterior lighting at CCAFS and PAFB has the potential to impact nesting sea turtles and hatchlings. Extensive research has demonstrated that the principal component of the sea-finding behavior of emergent hatchlings is a visual cue (Carr and Ogren 1960, Dickerson and Nelson 1989, Witherington and Bjorndal 1991). Artificial lighting on or near the beach has been documented to cause disorientation (loss of bearings) of hatchling and adult sea turtles

Figure 6-2. Light Shield at SLC 37

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(Witherington and Martin 1996), with often fatal results.

Lighting is a major concern of sea turtle conservationists and regulatory agencies. Since the 1980s, the 45 SW has taken an aggressive approach to minimize the impacts on sea turtles caused by exterior lighting by developing Light Management Plans (LMPs), conducting light inspections, monitoring sea turtle nesting and hatch rates, replacing lights with amber light emitting diode (LED) lamps, full cut off low pressure sodium (LPS) light fixtures, and adopting a 45 SW exterior lighting instruction, 45 Space Wing Instruction (SWI) 32-7001 (available at http://static.e-publishing.af.mil/production/ 1/45sw/publication/45swi32-7001/45swi32_7001.pdf). 45 SWI 32-7001 directs all facilities on the 45 SW to extinguish unnecessary lights during nesting season (1 May - 31 October) in compliance with established federal, state and local laws.

The preferred method of reducing direct and indirect light on the beach is to eliminate the light source. In most cases, this cannot be achieved due to safety, security, and operational requirements. Research shows that various types of lights affect sea turtles to varying degrees and LPS lamps (589-590 nanometers in wavelength) have the least effect on sea turtles (Nelson Engineering Co. 2001). Therefore, retrofitting existing light fixtures with LPS lamps is a preferential action that reduces the impacts to nesting and emerging sea turtles. The majority of facilities with detrimental exterior lighting have been retrofitted with LPS lamps as well as shielding in order to minimize the adverse effects of artificial lights on sea turtles and other wildlife. LMPs are required for new, large construction projects within the 45 SW in order to ensure that lighting issues for that particular site are addressed from design to post-construction. Currently, all major facilities with significant exterior lighting, such as launch complexes, port facilities and payload processing facilities have individual LMPs.

LMPs typically contain the following information:

- Facility drawings detailing the location, type and number of exterior lights;
- Specific security and lighting requirements;
- Facility manager Point of Contact (POC); and
- Schedule of lighting modifications required to comply with 45 SWI 32-7001 (if required).

Additionally, the 45 SW is transitioning to amber LED lamps when feasible because the LED lamps are more energy efficient and more turtle friendly and the light produces a more focused beam rather than the lateral spread observed with LPS.

6.2.7 Ground and Surface Water Discharges

CCAFS and PAFB's location adjacent to the Banana River and Atlantic Ocean creates the potential for impacts to surface waters. Numerous species, including several federally listed species, utilize the surface waters adjacent to CCAFS and PAFB as habitat (**Section 5.4** and **Table 5-5** for a summary of listed species). Preventive measures are taken to minimize impacts to surface waters associated with activities at the 45 SW.

The only groundwater point source discharge at CCAFS is the treated domestic wastewater effluent. The treatment plant effluent and groundwater monitoring is stipulated by the National

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Pollutant Discharge Elimination Systems (NPDES) permit to ensure no significant degradation of groundwater, and to ensure effluent is not discharged to surface waters. The CCAFS Wastewater Treatment Facility (WWTF) includes advanced treatment processes that produce effluent suitable for re-use. Impacts to CCAFS's groundwater resources (primarily groundwater mounding) are limited to a small area in the immediate vicinity of effluent disposal facilities. No significant impacts have been documented or anticipated on the natural communities near the WWTF and the percolation ponds from the disposal of wastewater effluent.

In 2009 the FDEP established a Total Maximum Daily Load (TMDL) for the Indian River and Banana River Lagoon (BRL) to reduce pollutant loading of total nitrogen and total phosphorus (FDEP 2010). CCAFS and PAFB installations discharge stormwater runoff to the BRL under NPDES Permits. Enforcement of pollutant reduction goals will be through the NPDES Municipal (separate) Stormwater Sewer System (MS4) permits. 45 SW properties are set to reduce discharges over a 15-year period which includes compliance pollutant load screening, street sweeping (removal of sediments), and structural best management practices.

Non-point source pollution at CCAFS consists primarily of stormwater run-off from impervious surfaces associated with industrial and administrative activities. The 45 SW also maintains a NPDES Multi Sector General Stormwater Permit (MSGP), along with multiple Environmental Resource Permits (ERP) from SJRWMD, for both CCAFS and PAFB. The MSGP addresses potential stormwater pollution associated with the industrial operations on CCAFS. As a part of the MSGP, the 45 SW developed SWPPPs for CCAFS (VZ Technologies 2014a) and PAFB (SpecPro 2010). These plans were originally created in 1996 and are updated every five years. The objective of the plans is to provide the 45 SW with a practical guide to preventing stormwater pollution. Successful implementation of these plans will fulfill regulatory requirements, promote environmental awareness, and improve the overall quality of stormwater discharges and, therefore, reduce impacts to natural resources.

See **Section 7.6**, Water Resource Protection, for additional information regarding the protection of 45 SW surface water and groundwater

6.2.8 Hazardous Materials and Hazardous Waste

USAF has established procedures for the handling, storage and disposal of hazardous materials on the 45 SW. Similarly, procedures have also been established for the handling, storage and disposal of hazardous waste (Management Plan 19-14). These programs are designed to prevent adverse impacts to the environment resulting from the use of hazardous materials and handling of hazardous waste. To minimize the potential for toxic air emissions and to control releases associated with fuels, fuel vapor scrubbers are used to control hazardous and toxic air emissions. All personnel involved in the handling of hazardous materials and hazardous waste receive safety and environmental awareness training concerning the proper handling techniques and spill response activities for these hazardous materials. With the exception of a potential accidental release (spill), the use of hazardous materials and the generation of hazardous wastes by operations on the 45 SW have low potential to adversely impact wildlife species or their habitats.

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With regard to spills, USAF has developed and implemented a comprehensive spill plan and program that establishes procedures to address spills and minimize spill impacts to the environment. Occasional spills on surface waters associated with the Navy and the USAF wharves within Port Canaveral, located on the Banana River, may also occur. Spills into these surface waters have the potential to impact sea turtles, manatees, other sea life, and submerged aquatic vegetation. Spill response personnel contact the personnel of the 45 CES/CEIE-C if a spill has the potential to impact wildlife and natural communities. To date, spills in these locations have consisted of relatively minor petroleum waste and bilge releases resulting in minimal environmental damage. No known mortality of endangered species has occurred due to spills. Spill response teams are available through the USCG, the Base Operating Support Contract, and commercial sources located at Port Canaveral and these teams are capable of cleaning up most spill incidents at CCAFS wharf facilities

An additional concern regarding potential impacts from hazardous materials is the Atlantic Ocean coastal beach, which constitutes the eastern boundary of both CCAFS and PAFB. Periodically, drums, containers, and other suspicious items are washed onto the beach from the Atlantic. The majority of these items are discarded from ocean-going vessels and identification of the contents is not easily obtainable. In some cases where contents have been analyzed, hazardous substances were identified. It is not possible to prevent items from washing ashore. However, periodic beach patrols are conducted to promptly discover potentially harmful items on the beach, remove such items before they can create an adverse impact to natural resources, and properly dispose of them.

Currently the CCAFS has a landfill that is only permitted to accept asbestos and construction and demolition debris disposal. According to 45 CES/CEIE-C management, placement of debris in the landfill has been suspended due to financial reasons; future use of the landfill is not known at this time.

6.2.9 Environmental Restoration Program

The Environmental Restoration Program (ERP) at CCAFS and PAFB is governed by the Corrective Action requirements outlined in each Environmental Resource Conservation and Recovery Act (RCRA) permit. Personnel of the 45 CES/CEIE-C coordinate with ERP personnel to ensure wildlife are not impacted during remediation projects and to coordinate and ensure ERP sites are re-vegetated with appropriate vegetation. When possible, wildlife are relocated from the project sites.

6.3 Potential Future Impacts

Potential future impacts to the natural resources at the 45 SW are largely related to development activities at the installations. Development of new launch programs, expansions to existing facilities, and new facility construction are the primary potential future impacts to natural resources for the 45 SW. The majority of the potential new impacts will be located on CCAFS. Due to the large size of CCAFS, its coastal location, and adjacency to KSC, these potential future impacts will be localized on the installation and are not anticipated to impact local or regional natural areas. There is also a proposed plan for enhanced use leasing of MTA which could result in a 50 year lease of a majority of the property. Unforeseen changes in the 45 SW mission may also produce unanticipated impacts to natural resources.

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If mission changes occur, the USAF will ensure proper environmental impact analysis and study. Some of these potential future impacts are briefly discussed in the following paragraphs.

6.3.1 New Launch Programs

CCAFS and the 45 SW have the potential to support new launch programs. New launch programs frequently seek to establish space vehicle processing and launch facilities at the 45 SW due to location, infrastructure, and launch support operations. The primary impact associated with the development of a new launch program is the construction of new facilities and the associated impacts to habitat and wildlife. Additional impacts include the processing and operation of launch related activities and exterior lighting. In an effort to minimize potential impacts to the 45 SW natural resources, new launch programs will be directed to locate launch facilities at one of the numerous abandoned SLC on CCAFS. The reuse of SLCs minimizes land clearing elsewhere within CCAFS and may facilitate the remediation of these SLCs. Recent examples include the Delta IV's use of SLC 37, the Atlas V's use of SLC 41, and SpaceX reutilization of SLC 40. The reuse of abandoned SLCs minimizes land clearing and facilitates the remediation of hazardous substances and materials at abandoned complexes.

6.3.2 Expansion to Existing Facilities

The Skid Strip upgrade is an example of the expansion of an existing facility within the 45 SW. In the past five years, expansion of the airfield was initiated (USAF 2013a). When completed, approximately 384 acres of scrub habitat will be removed for the airfield clearzone project. The primary impacts to natural resources associated with these types of improvements include a potential increase in exterior lighting, land clearing, and development in scrub habitat (USAF 2009b). Prior to the initiation of these improvements, an EA was completed (USAF 2009b) and efforts were made to reduce impacts to the 45 SW natural resources. In addition, Formal Section 7 Consultation was completed and the resulting BO required mitigation at a 3:1 replacement ratio (Hankla 2011; see **Appendix B**) and 1,009 acres of overgrown scrub habitat were restored. The Skid Strip upgrade is currently in Phase 3 of clearing activities (USAF 2014b).

Complex 25 is being refurbished by the Navy to provide a central test and training location for the weapons system on the existing OHIO class submarine and OHIO replacement class submarine. The program, Strategic Weapons System Ashore, involves refurbishing former Launch Pad 25B that was historically used for test flights of the Navy's submarine-launched ballistic missiles. This refurbishment is on an existing pad; therefore little to no direct impact to natural resources is anticipated.

6.3.3 New Facility Impacts

Coastal construction is a potential example of new facility impacts. The coastal zone, which includes the entire State of Florida provides habitat for numerous T&E species, such as sea turtles and the SEBM. Construction within the coastal zone has the potential to impact natural communities, including natural resources on 45 SW properties. Construction projects at CCAFS, PAFB, MTA, and JDMTA will be carefully reviewed for impacts to federally listed plant and wildlife species as well as site considerations such as flood elevation and coastal construction

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setback requirements. The primary objective is to avoid impacts to the coastal zone and site facilities in developed areas of the installations.

6.4 Natural Resources Needed to Support the Military Mission

Natural resources required to support the mission of the 45 SW include:

- Coastal areas;
- Open space;
- Water quality preservation; and
- Open waters at the Port and Banana River.

6.4.1 Coastal Areas

In addition to providing habitat for several protected species, the majority of the launch facilities at CCAFS are located along the shoreline of the Atlantic Ocean. These complexes are located along the coast to allow launch vehicles to ascend over the open water of the Atlantic Ocean and avoid populated areas of the state. Additionally, numerous facilities and roadways are located adjacent to the beaches and dunes on CCAFS and PAFB. To successfully accomplish its mission, the 45 SW must preserve coastal areas, minimize erosion, and stabilize the shoreline in an environmentally sensitive manner.

6.4.2 Open Space

The continued presence of open space at 45 SW installations is necessary to support the military mission. Open space is required for security and safety clear zones associated with launch operations and training exercises. The potentially hazardous operations associated with the processing and launching of rockets requires significant open space for clear zones around launch complexes and processing facilities. Open space for clear zones ensures personnel are located a safe distance from potentially hazardous launch operations. Open areas also provide flexibility for future mission requirements.

Open space is also required to maintain the significant number of lines of sight associated with observing and tracking rocket launches. Training activities are frequently conducted at the 45 SW and open space is a necessity for successful training exercises. Numerous military organizations temporarily deploy to the 45 SW to utilize the open space available for training. Open space along the coast, the Banana River shoreline, and at MTA is essential to support military operations and training.

6.4.3 Water Quality Preservation

The 45 SW mission relies on the continued availability of both ground and surface water resources. Compliance with the permit requirements, and the associated preservation of ground water quality, is necessary for continued mission success. The preservation of the 45 SW wetlands provide flood control and water quality functions and minimize direct discharges to surface water resources. Additionally, the preservation of water quality in the surface waters

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adjacent to CCAFS and PAFB contribute to the overall quality of life in Brevard County due to the recreational use of the 45 SW beaches, marina and Banana River access points.

6.4.4 Open Waters

The surface waters adjacent to CCAFS and PAFB also play a critical role in supporting the mission of the 45 SW. The surface waters at Port Canaveral support a wide range of military operations including the NOTU, the USAF and Army wharves, as well as other operations at the Port. In the past, the NASA solid rocket motor (SRMs) recovery operation utilized the Banana River and the NASA recovery vessels were docked in the Banana River. Since the shuttle program was retired, NASA no longer performs the recovery of SRMs. The 920th Rescue Wing, as well as other organizations, use the Banana River for open water training exercises.

6.5 Natural Resource Constraints to Missions and Mission Planning

Due to the nature and location of the 45 SW properties, there are natural resources constraints to mission-related activities; in some cases, constraints that are relatively easy to navigate, in other cases constraints that require compensation. **Table 6-5** details potential opportunities and constraints to the 45 SW mission due to natural resources.

Table 6-5. Natural Resource Opportunities and Constraints (page 1 of 2)

Resource	Opportunity	Constraint
Floodplains	Preserve floodplains and natural ecological function such as conveyance of floodwaters and storm surges.	▪ Limit construction opportunities by prohibiting development in the floodplain. ▪ Increased construction costs if facilities are built in floodplains due to incorporation of flood control measures into building design.
Scrub habitat	Manage scrub habitat to support scrub-endemic wildlife and vegetation (consistent with BOs). Reduce fuel loads and provide mission critical land clearing for security requirements.	▪ Impacts to launch facilities, payload processing facilities and launch hardware from smoke. ▪ Potential wildfire hazard and facility and infrastructure destruction.
T&E Species	Provide habitat for federally listed T&E species and facilitate management, research, and monitoring of sensitive species.	▪ Consistent with the protecting sensitive species, limit construction opportunities to avoid impacts to habitat for federally listed species. ▪ Increase mission planning requirements related to T&E species management.

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Table 6-5. Natural Resource Opportunities and Constraints (page 2 of 2)

Resource	Opportunity	Constraint
Coastal resources	Maintain natural dune vegetation and structure. Conserve endemic flora and fauna. Minimize storm surge impacts. Decrease exterior lighting adjacent to the beach.	▪ Limit the development of new facilities along and adjacent to the Atlantic coast.
Wetlands	Restore connections between estuarine wetlands and Banana River. Improve water quality and estuarine habitat.	▪ Potential mosquito control impacts from removing impoundments. ▪ Increased bird roosting/foraging habitat and increased BASH risk. ▪ Limit potential construction due to regulatory requirements to avoid wetlands.
Surface water	Maintain undeveloped portions of Banana River shoreline and Atlantic Coast. Minimize development and stormwater impacts to adjacent surface waters.	▪ Limit the development of new facilities adjacent to shorelines.
Wildlife Habitat at MTA	Provide a refuge for native flora and fauna that would otherwise be lost due to development.	▪ Encroachment creating need to consider enhanced use lease or sale of property due to complaints about training.
Outdoor recreation	Develop new recreational trails. Increase access to the beach and fishing areas.	▪ Security and safety threats due to increase of personnel recreating on base. ▪ Potential for fish and wildlife population degradation, including increased pressure on fish populations, and disturbance to foraging and nesting migratory birds on beach.

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Chapter 7. Natural Resources Program Management

7.1 Natural Resources Program Management

The guiding philosophy of this INRMP is to take an ecosystems approach to managing the natural resources present on the 45 SW installations (see **Section 2.2**). Ecosystem management provides a framework to link the military mission to local, regional, and global ecological integrity. Sustaining ecosystem integrity is the best way to protect and enhance biodiversity, ensure sustainable use, and minimize the effort and cost of management. Ecosystem management is based on clearly stated goals and objectives, and associated activities and projects. This INRMP identifies goals and objectives, and presents the means to accomplish them, as well as the methodologies to monitor results.

This Section summarizes each technical area of natural resources management. In a given section, relevant management strategies, practices, guidelines, Best Management Practices (BMPs) and priorities will be presented, as applicable to the technical topic. Goals and objectives are presented in **Chapter 8** and the work plans (i.e., activities and projects) for CCAFS, PAFB, MTA and JDMTA are presented in **Table 10-1**, in **Chapter 10**. Activities generally refer to in-house, no cost actions under taken by USAF or 45 SW personnel. Projects generally refer to actions that are performed by others, usually under contract to the 45 SW or US Air Force Civil Engineer Center (AFCEC). In addition, projects can be performed using non-DoD funds or by volunteers. See **Chapter 9** for more details about funding and implementation. Laws and regulations are not summarized in each sub-section, although primary legal drivers are identified; as well as the relevant goal and objectives identifiers. A complete summary of all relevant laws, regulations, EOs and policies is provided in **Appendix N**.

Primary Regulatory Drivers

- SAIA
- DoDI 4715.03
- AFI 32-7064

Programmatic management includes those items that pertain to multiple technical areas and are relevant to implementing a natural resources program as a whole, such as environmental awareness, public outreach, GIS data management, INRMP annual reviews, and adaptive management. This Section provides an overview of the various organizations responsible for implementing the INRMP, environmental awareness training and education, and the agreements in place to facilitate this process.

7.1.1 Responsibilities

The INRMP has been organized to ensure the implementation of year-round, cost-effective management activities and projects that meet the requirements of the 45 SW. Various organizations within the USAF and 45 SW are responsible for the implementation of the INRMP along with outside agencies (e.g., USFWS, FWC). These entities and their responsibilities are provided in the following subsections.

7.1.1.1 US Air Force Space Command

The US AFSPC operates forces to provide support from space to terrestrial forces, ground control support for DoD satellites in peacetime and through all levels of conflict, warning of space or missile attacks, and the ability to negate every opposing space system during conflict.

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7.1.1.2 US Air Force Civil Engineering Center

The AFCEC, headquartered at Joint Base San Antonio-Lackland, is a CE field operating agency responsible for providing responsive, flexible full-spectrum installation engineering services at more than 75 locations worldwide. The Environmental Directorate is a field operating agency of AFCEC that is organized into the following five divisions: NEPA, Environmental Restoration, Technical Support, Compliance, and Operations. AFCEC is responsible for providing command and technical guidance to the 45 SW natural resources management program. The directorate is responsible for assisting with program implementation; ensuring effective natural resources stewardship is an identifiable and accountable function of management; planning, managing, and programming USAF restoration, compliance, sustainability, technical support, and operations; and reviews and approves the INRMP.

7.1.1.3 45 SW Commander

The 45 SW/CC ensures that the INRMP is developed and maintained, and serves the official signatory to the INRMP. The Commander also ensures that funding and staffing are sufficient to implement the INRMP.

7.1.1.4 45 SW Civil Engineer Squadron

The 45 SW Civil Engineering Squadron (45 SW/CES) is responsible for all facility construction and maintenance activities on the 45 SW installations. In addition, this office will ensure the habitat management protocols established in this INRMP for the conservation and enhancement of biodiversity are followed.

7.1.1.5 45 SW Civil Engineer Squadron / Environmental Conservation Element

The 45 SW Environmental Conservation Element (45 CES/CEIE-C) is responsible for ensuring that activities associated with the implementation of this INRMP adhere to applicable federal, state, local, and USAF environmental regulations and policies. The 45 SW as a whole is responsible for the implementation of the INRMP, but portions of the INRMP are more applicable to certain units of the 45 SW.

The 45 CES/CEIE-C is responsible for establishing and implementing a conservation education program to instruct 45 SW personnel and other site users on the protection and enhancement of biological diversity; directing most of the ongoing natural resources management activities presented in this INRMP; and reviewing all environmental documents and new construction/development projects. However, several management activities [e.g., Bird Aircraft Strike Hazard (BASH)] fall under the responsibilities listed for other organizations. The 45 CES/CEIE-C regularly coordinates with other 45 SW organizations and tenants, including 45 SW Flight Safety Office (45 SW/SEF) for BASH activities, 45 SW Plans and Program Requirements Office (45 SW/XPR) when new customers are looking to conduct operations on 45 SW land, the Portfolio Optimization Element (45 CES/CENP) for general land use planning and General Plan coordination, Force Support Squadron (morale/outdoor recreation), Staff Judge Advocate, Public Affairs Office, among others.

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7.1.1.6 45 SW Flight Safety Office

The Flight Safety Office (45 SW/SEF) is responsible for ensuring the BASH Plan is followed, and the mission of this office is to protect aircrews, personnel, and USAF assets at the airfields and downrange locations operated by the 45 SW. This office also supports mishap preparedness for aviation and space mishaps.

7.1.1.7 45 SW Plans and Programs Requirements Office

The Plans and Programs Requirements Office (45 SW/XPR) is the central Point of Contact (POC) for managing/maintaining MOAs/MOUs and other agreements, commercial space activities, and coordinating initial support agreements. Although the 45 SW/XPR maintains these agreements, the technical POC is responsible for developing and providing the language for these agreements.

7.1.1.8 45 SW Portfolio Optimization Element

The Portfolio Optimization Element (45 CES/CENP) is responsible for strategic planning and activity/asset performance; advising and providing counsel to employees regarding policies, procedures and directives of management; establishing, developing and maintaining effective working relationships with other sections in the organization; providing advice and assistance to management officials regarding these functions to meet current and long range program goals and objectives, and incorporating the application of environmental compliance and natural/cultural resources standards for this functions.

7.1.1.9 45 SW Force Support Squadron

The 45 SW Force Support Squadron (45 FSS) is responsible for developing and sustaining the force by delivering robust and evolutionary quality of life and personnel programs. These programs must also be cognizant of potential impacts on natural resources and include outdoor recreation programs.

7.1.1.10 Staff Judge Advocate

The 45 SW Staff Judge Advocate (45 SW/SJA) is responsible for ensuring that the implementation of the management objectives contained within this INRMP meet all of the USAF's regulatory and statutory requirements that pertain to natural resources management. The legal office will review any future natural resources management proposals and alert the 45 CES/CEIE-C should there be any regulatory conflicts or shortfalls. In addition, the legal office will keep the 45 CES/CEIE-C informed of any new statutes or regulations that might affect natural resources management on the 45 SW installations.

7.1.1.11 Public Affairs Office

The 45 SW Public Affairs Office (45 SW/PA) is responsible for the coordination of public access for events and news coverage for the 45 SW. The 45 SW/PA serves as the point-of-contact to interface between the Commander and civilian groups interested in using 45 SW installations for environmental, educational, or other purposes.

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7.1.1.12 Cooperating Agencies

The USFWS, NMFS and FWC provide technical assistance to 45 CES/CEIE-C and serve as cooperators during the development and implementation of the INRMP. Specifically, the USFWS and NMFS are the principal advisors to the 45 SW on issues regarding federally protected rare, threatened, and endangered species, while the FWC provides guidance on species and habitats of special state concern. The three cooperating agencies also participate in annual reviews and the review for operation and effect, and serve as an official signatory of the INRMP.

7.1.2 Environmental Awareness

7.1.2.1 Training and Education for Natural Resource Managers

Natural resource personnel of the 45 CES/CEIE-C are required to take the course, *DoD Natural Resources Compliance*, developed by the DoD Interservice Environmental Education Review Board (ISEERB) and offered for all DoD Components by the Naval Civil Engineer Corps Officers School (CECOS). The CECOS website http://www.netc.navy.mil/centers/csfe/cecos/Default.aspx provides schedules and registration information. Other DoD environmental management courses can be found at the Army Logistics University (http://www.alu.army.mil/) and Air Force Institute of Technology (http://www.afit.edu/).

45 CES/CEIE-C personnel are encouraged to attend and participate in appropriate national, regional and state conferences and training courses. The National Conservation Training Center managed by the USFWS (http://training.fws.gov/) and the Bureau of Land Management Training Center (http://www.ntc.blm.gov/) offer a wide range of appropriate natural resource professional courses suitable for USAF natural resource managers. Natural resource management personnel of the 45 CES/CEIE-C are also encouraged to obtain professional registration and certification.

Natural resource managers of the 45 CES/CEIE-C and environmental support contractors receive appropriate training in the capture and handling of wildlife, including sick, injured, dead and nuisance wildlife. Personnel are provided written policies and procedures and are expected to adhere to applicable state and/or Federal guidelines and permits. In addition, as applicable, extensive on the job training is provided in the field to inexperienced and/or new personnel by qualified individuals of the 45 CES/CEIE-C. Under some circumstances, individuals must show competency before they are allowed to conduct certain activities on their own.

The DoD supported publication *Conserving Biodiversity on Military Lands – A Handbook for Natural Resource Managers* (Leslie et al. 1996, Benton et al. 2008) provides information regarding the management of natural resources programs and is available at http://www.dodbiodiversity.org/.

45 CES/CEIE-C personnel are encouraged to attend applicable training in the NEPA and the EIAP. Initial and refresher NEPA/EIAP training can increase staff knowledge, improve effective document writing skills and facilitate the decision making process.

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Natural resources staff of the 45 CES/CEIE-C that support the BASH program receive flight line drivers training, training in identification of bird species occurring on airfields, and specialized training in the use of firearms and pyrotechnics as appropriate for their expected level of involvement. Educational resources are available to personnel including website information, memberships and subscriptions to wildlife and conservation organization periodicals and wildlife identification books, placards and keys. An extensive collection of photographs of wildlife species known and/or expected to occur on 45 SW installations is maintained and available to 45 SW natural resource personnel. Natural resource personnel are encouraged to photograph the 45 SW natural resources, including wildlife and habitats, as they can be beneficial to the education of all base personnel and the public at large.

45 CES/CEIE-C personnel that participate in prescribed fire activities shall possess and maintain a current certification of training for *Basic Wildland Fire Behavior S-190*, *Basic Wildland Firefighter with Standards S-130* and *Incident Command I-200 Modules 2-6*.

Natural resource managers of the 45 CES/CEIE-C that are listed on the FWC Marine Turtle Permit are required to attend annual permit holder workshops and training provided by the FWC. This training addresses sea turtle monitoring guidelines and data collection methodologies to ensure quality sea turtle nesting surveys are conducted by permit holders. Sea turtle nesting data collected by 45 CES/CEIE-C personnel is provided to FWC on a monthly basis and a comprehensive database is provided FWC at the end of the nesting season. In addition to the training provided by the FWC, experienced 45 CES/CEIE-C personnel provide extensive on the job training to individuals conducting the nesting surveys and competency is required prior to them working on their own.

45 CES/CEIE-C personnel that operate all-terrain vehicles (ATV) while conducting natural resource activities shall possess and maintain a current certificate of training from the ATV Safety Institute's ATV Rider Course (see **Section 7.1.4**).

All individuals enforcing fish, wildlife and natural resource laws on 45 SW lands must receive specialized, professional enforcement training regarding the fish, wildlife and natural resources in compliance with the Sikes Act. This training may be obtained by acquiring certification as a state fish and wildlife conservation law officer or successfully completing the Natural Resources Police Training program course at the Federal Law Enforcement Training Center (FLETC) (http://www.fletc.gov/). Correspondence courses and standard Security Forces training do not meet the requirement of the Sikes Act. Currently, there is no Conservation Law Enforcement Officer (CLEO) for the 45 SW.

7.1.2.2 Education and Training for 45 SW Base Personnel

The 45 SW CES/CEIE-C encourages individuals living or working at 45 SW installations to demonstrate good environmental stewardship. Environmental and natural resource awareness training is incorporated into base-wide newcomer's orientation briefings and information forums at all levels, including the quarterly Environmental, Safety and Occupational Health (ESOH) Council meetings.

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45 CES/CEIE-C personnel periodically conduct awareness training for base personnel who are involved in operations or recreational activities that may have the potential to impact wildlife or natural resources on 45 SW installations.

Electronic publications are periodically sent to all base personnel through the Public Affairs unit (45 SW/PA). Articles and publications featuring natural resource topics are provided periodically in base newspapers.

Additional training will be provided to base personnel, including military, civilians, contractors and other tenants, who work at the 45 SW installations on an as needed basis.

7.1.2.3 Commander Awareness

The *DoD Commander's Guide to Biodiversity* (available at http://www.dodbiodiversity.org/docs/commandersGuide.pdf) provides basic natural resources management guidance for installation and wing commanders. In addition, the Executive Summary of the INRMP provides a summary for the installation and wing commanders, installation CEs, and other senior officers to use for awareness of 45 SW installation natural resources and inform them of how the natural resources management program supports mission objectives.

7.1.3 Biological Opinions and Permits

The 45 SW has several active BOs that stipulate conservation measures and requirements to mitigate potential adverse effects on a threatened or endangered species. Copies of the active BOs are found in **Attachment Appendix B**.

Additionally, permits are issued to the 45 SW to allow certain activities regarding natural resources. Permits may be issued by the FWC or USFWS. Current permits issued to the 45 SW include a steel trap permit, alligator relocation permit, bird depredation permit and a marine turtle permit. A complete summary of the 45 SW BOs and permits are included **Appendix B**.

Permits from Florida Forest Service (FFS) are required for prescribed fires.

A permit is also required for air curtain incineration operations (burning material mechanically removed from scrub habitat, for habitat restoration).

7.1.4 ATV Use at 45 SW

The use of ATVs is generally not permitted on 45 SW installations. The only approved use for off-road vehicles, like the ATV, is for 45 CES/CEIE-C environmental personnel and for security personnel performing safety and security operations. All personnel are required to attend ATV training prior to using these vehicles. Personnel from the 45th Security Forces Squadron typically provide operational ATV safety training, Security personnel have been provided an electronic briefing (slide show) and poster board presentation to use for training purposes that outlines environmental protection while operating ATVs for mission safety and security operations. The trainer also provides a short briefing discussing the importance of protecting natural resources for future use. In addition to safety adherence, personnel are cognizant of natural and cultural resource protection practices while operating ATVs. The ATV training area

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is in a developed area that is a mixture of grass and sand; no protected species are within or near this area.

Personnel do not drive ATVs through sensitive areas (i.e., archeological, protected habitat or wetlands) and make all attempts to avoid harassment of wildlife due to noise disturbances. 45 CES/CEIE-C personnel utilizing ATVs will adhere to the following requirements:

- Wear appropriate safety equipment as required for operation of the off-road vehicle.
- Wear a reflective outer upper garment during hours of darkness.
- Remain cognizant of heat stress and signs that you or co-workers could be in danger.
- Drive at a speed that is appropriate for the terrain, visibility conditions, and expertise. Speeds will not exceed 25 miles per hour (mph).
- Headlights must be used at all times while on roadways.
- Follow all traffic regulations.
- Yield the right of way to all traffic.
- Minimize strike hazards by being constantly aware of changes in terrain and newly deposited debris.
- Avoid driving in water.
- Carry a cell phone and/or radio and check in with supervisors upon completing the sea turtle survey or other field activities.
- Be aware of the presence of sea turtle nests, ground nesting birds, archeological resources, wetlands, and make all attempts to avoid disturbance.
- Minimize damage to vegetation and soils.

7.1.5 Cooperative Agreements

Intra- and inter-agency cooperation, coordination, and communication at the federal, state and local levels are requisite to the success of the INRMP. As mentioned above, the USFWS, NMFS, and FWC review the INRMP and its implementation. Specialized expertise is required to adequately manage natural resources on the 45 SW installations. Technical assistance will be sought from Federal and state agencies, universities, and special interest groups. Additional technical assistance is also available through the following DoD initiatives.

- DoD Partners in Amphibian and Reptile Conservation (PARC) - initiative to support management of reptiles and amphibians on military installations. More information at http://www.dodnaturalresources.net/DoD-PARC.html.
- DoD Partners in Flight (PIF) – initiative to support management of birds on military installations. It is part of the international PIF partnership and facilitates connections between DoD entities and other PIF partners. More information at http://www.dodpif.org/.

In addition, the DoD and subcommand entities have Memoranda of Understanding (MOUs), Memoranda of Agreement (MOAs), and other cooperative agreements with

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other Federal agencies, conservation and special interest groups, and various state agencies in order to provide assistance with natural resources management at installations across the US. Generally, these agreements allow installations and agencies or conservation and special interest groups to obtain mutual conservation objectives. The DoD agreements applicable to the 45 SW properties include:

- MOU between DoD and USFWS / Association of Fish & Wildlife Agencies for a Cooperative Integrated Natural Resource Management Program on Military Installations associated with the ecosystem-based management of fish, wildlife, and plant resources on military lands (2013).
- MOU (two) between DoD and USFWS to promote the conservation of migratory birds (2011 and 2014).
- MOU between the DoD and USEPA to form a working partnership to promote environmental stewardship by adopting integrated pest management strategies to reduce the potential risks to human health and the environment associated with pesticides (2012).
- MOA for Federal Neotropical Migratory Bird Conservation Committee ("Partners in Flight-Aves De Las Americas") among DoD, through each of the Military Services, and over 110 other Federal and state agencies and non-governmental organizations (1991). In addition, the USAF signed an addendum to this MOA, thereby including itself in the agreement (1991).
- MOU between the DoD and Ducks Unlimited, Inc. to provide a foundation for cooperative development of selected wetlands and associated uplands in order to maintain and increase waterfowl populations and to fulfill the objectives of the North American Waterfowl Management Plan, within the context of DoD's environmental security and military missions (2006).
- MOU between DoD and Natural Resources Conservation Service (NRCS) to promote cooperative conservation where appropriate (2006).
- MOU with Watchable Wildlife Incorporated (2002).
- MOU between the DoD and Bat Conservation International (BCI) to identify, document and maintain bat populations and habitats on DoD installations (2011).
- Cooperative Agreement between DoD and The Nature Conservancy to work cooperatively in areas of mutual interest (2010).
- Interagency Agreement (2010) and MOU (2009) between USAF and US Forest Service (USFS) to enhance cooperation and improve public service, and management of natural and cultural resources on lands managed by the USAF and the USFS.
- For a further list of cooperative agreements and MOUs please visit http://www.denix.osd.mil/nr/LegislationandPolicy/MOUsandMOAs.cfm for DoD list, and AFCEC website for USAF list of agreements/MOUs.

In addition, the 45 SW maintains cooperative agreements for specific purposes. These cooperative agreements include:

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- A cooperative agreement with USFWS and KSC since 1984 to support wildland fire activities, including prescribed fire is in the process to become a MOA. The MOA between the 45 SW, USFWS and JFK Space Center (NASA) for Prescribed Burning on the Merritt Island NWR and CCAFS is currently in draft and being worked between the agencies currently and is projected be finalized in 2015. Prescribed burning notifications and approvals are processed through the prescribed burn distribution lists that include personnel at NASA, MINWR and CCAFS so procedures outlined in the MOA are being followed even though it hasn't been officially signed.

7.2 Fish and Wildlife Management

Fish and wildlife management at CCAFS, PAFB, MTA and JDMTA will focus on maintaining and restoring natural habitat favorable for indigenous fish and wildlife in a manner consistent with the military mission and all applicable laws and regulations. Information pertaining to fish and wildlife species known or with the potential to occur at the 45 SW installations, including protected species, is summarized in **Sections 5.3** and **5.5** and species lists are provided in **Appendix F.** This Section addresses the management of migratory birds, nuisance wildlife, injured wildlife, and the hunting and fishing program.

Primary Regulatory Drivers

- SAIA
- MBTA
- AF32-7064
- DoDI 4715.03
- EO 13186
- FAC 68A (Freshwater Fish and Wildlife)
- Chapter 379, F.S. (Fish and Wildlife Conservation)

7.2.1 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) prohibits, unless permitted by regulations, the pursuit, hunting, take, capture, killing or attempting to take, capture, kill, or possess any migratory bird included in the Migratory Bird Treaty, including any part, nest, or egg of any such bird (16 USC § 703). The DoD has a MOU with the USFWS pursuant to EO 13186 *Responsibilities of Federal Agencies to Protect Migratory Birds*, which outlines a collaborative approach to promote the conservation of migratory bird populations. This MOU specifically pertains to natural resource management activities, including, but not limited to, habitat management, erosion control, forestry activities, invasive weed management, and prescribed burning. It also pertains to installation support functions, operation of industrial activities, construction and demolition activities, and hazardous waste cleanup. In February 2007, the USFWS finalized regulations for issuing incidental take permits to the DoD. If any of the Armed Forces determine that a proposed or an ongoing military readiness activity may result in a significant adverse effect on a population of migratory bird species, then they must confer and cooperate with the USFWS to develop appropriate and reasonable conservation measures to minimize or mitigate identified significant adverse effects (50 CFR Part 21).

The 45 SW reviews all projects to ensure compliance with the MBTA and EO 13186. The 45 SW has a federal depredation permit for PAFB and CCAFS (see **Appendix B**). This permit covers all migratory bird species (including residents) located on PAFB and CCAFS, and

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accounts for an unplanned number of birds that may be impacted with changing mission, safety, and damage assessments.

Control methods for migratory birds emphasize non-lethal processes, but some lethal methods are needed. The first method employed at the CCAFS Skid Strip and the PAFB airfield is operational control, which includes mowing grasslands to a specific height to reduce use by birds. Other non-lethal methods are scaring the birds away from the airfield with vehicles, air cannons, screamer devices, and/or bird scare shot. Air cannons have been used at PAFB since 1999 and are regularly re-mobilized and tested. Air cannons were recently installed at CCAFS. Depredation and shooting is used as a last resort.

Occasionally, the presence of a nest or egg prevents or delays operations for the 45 SW. The Migratory Bird Permit (MB673776-0) issued by USFWS for CCAFS and PAFB does not allow for the "take or release of any migratory birds, nests, or eggs on federal lands without additional prior written authorization from the applicable federal agency . . . " For example, owls are attracted to launch towers which provide a high point for observation and serve as potential nest sites. Currently, nest-related issues are dealt with on a case-by-case basis. The 45 CES/CEIE-C is currently discussing this issue with USFWS that would allow the "take" of some nests that are laid on structures and/or vehicles. In the past, and prior to issuance of this Migratory Bird Permit, 45 SW natural resource personnel removed several owl eggs from nests to prevent egg loss as the result of launches. One juvenile owl was removed from a nest prior to a launch, returned two days later, and successfully fledged. All eggs and/or juveniles were taken to a licensed wildlife rehabilitator (Maitland Bird of Prey Center). All viable eggs were incubated and, if successful, fledglings were released within CCAFS.

CCAFS is designated as an "Important Bird Area" by the American Bird Conservancy, and has been identified as being significant for world bird conservation based on numbers, species and habitat present. CCAFS provides preferred habitat for numerous bird species, both resident and migratory bird species. A 2007 migratory bird study found significant use of mangrove, scrub hammock taller than seven meters, oak-palmetto shorter than seven meters, and coastal strand habitats (SpecPro 2007). The management of migratory birds on CCAFS is achieved through several programs. For example, scrub habitat restoration for the Florida Scrub-jay, although it is a resident bird species, is beneficial to numerous other migratory bird species. Detailed information on the Florida scrub-jay and the scrub restoration program can be found in **Appendix C**.

Per the Migratory Bird Treaty Reform Act of 2004, non-native bird species (not native to the US or its territories) and bird species not found in the US as a result of natural biological or ecological processes are not protected. Bird species that fall under this umbrella will not be protected on 45 SW properties, but will be treated humanely if depredation is required.

7.2.2 Nuisance Wildlife and Pest Management

Nuisance wildlife is defined as wildlife species with the potential to impact T&E species; nuisance wildlife issues are handled by a contractor to the USAF. The exception is nuisance wildlife on the airfield related to the BASH program; airfield management has the primary responsibility for nuisance wildlife related to BASH program (see **Section 7.12**). Pest

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management is primarily concerned with pests such as ants, mosquitoes, rodents in buildings, etc., and pest management/control issues are also handled by the same contractor that addresses nuisance wildlife issues (see **Section 7.13**). A copy of the IPMP and BASH Plan is included in **Appendix G and Appendix L**, respectively.

While the nuisance wildlife contractor and airfield management personnel have the primary responsibility for the eradication/removal of nuisance wildlife species on SW properties, the 45 CES/CEIC-C natural resources personnel will normally respond to calls received related to wildlife (see **Section 7.2.3**). The nuisance wildlife contractor uses live traps to capture and release animal. If the Contractor determines the capture is beyond their capability, the 45 CES/CEIC-C natural resources personnel are contacted for assistance. Furthermore, natural resources personnel are the main POC for any wildlife issues that arise at the 45 SW properties that do not involve routine pest control related activities. For example, the 45 CES/CEIE-C responds to alligator sightings/phone calls. If relocation is necessary and the alligator is less than 4 feet in length, 45 CES/CEIE-C personnel will relocate the alligator. If greater than 4 feet long, the state trapper is contacted for alligator capture.

For the purpose of minimizing depredation of sea turtle nests by nuisance species, a wildlife control program was initiated in 1985 on 45 SW beaches. According to the Recovery Plans for the US populations of loggerhead and green turtles, actions needed to achieve recovery of the species include ensuring at least 60% hatch success. Factors affecting nest success include depredation, tidal inundation, and unsuccessful development of eggs due to unsuitable surrounding substrate. To reduce depredation impacts to nesting sea turtle populations on 45 SW properties, a trapping program is conducted each year to lower the density of nuisance species on and near the beach prior to and during the marine turtle nesting season.

Nuisance wildlife of particular concern for the 45 SW includes raccoons, feral hogs, coyotes, and Africanized honey bees (AHB; *Apis mellifera scutellata*). Deer populations were high in the 1980s and considered a nuisance on CCAFS. However, populations have dropped significantly over the years. Detailed information on wildlife control pertaining to these animals is presented in the following sections. Removal of animals from 45 SW properties is conducted IAW applicable federal and state laws and is coordinated with both state and federal agencies, as appropriate. Data is kept regarding the location and sex of every animal captured.

7.2.2.1 Raccoons

Historically, raccoon depredation has been the greatest factor affecting sea turtle nest success on CCAFS. Prior to the initiation of the wildlife control program on the 45 SW beaches, raccoons were depredating close to 95% of all turtle nests deposited on CCAFS. According to 45 CES/CEIE-C personnel, since the initiation of the trapping program, nest depredation rates caused by raccoons on CCAFS has varied between 10% and 35%; the nest depredation rate on PAFB beaches is minimal (less than 1%).

Removal of the animals has proved to be the most effective method to control predation. Relocation of the raccoons from the beach to the western shoreline of CCAFS was unsuccessful when it was attempted in the 1980s. The tagged animals returned to the beach within days of their release.

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According to data maintained by the 45 CES/CEIE-C unit, an average of 100 raccoons (average for years 2004 through August 2014) are trapped and removed from CCAFS each year. Within CCAFS, the USAF nuisance wildlife contractor personnel conduct raccoon trapping using box and leg traps, as well as employ a shoot-on-sight system. All raccoons are euthanized on site. With the exception of leg trapping, raccoon removal is only conducted within a ¼ mile of the beach. The contractor is authorized to euthanize any raccoon captured via leg traps anywhere within CCAFS. Trapping on the beach is conducted by 45 CES/CEIE-C personnel during the sea turtle nesting season; the nuisance wildlife contractor euthanizes these raccoons. The removal of raccoons is coordinated with state and federal agencies and leg trapping is allowed by permit. The majority of the raccoons are removed from inland areas prior to the beginning of the nesting season. Once nesting season starts, traps are moved to the beach. Throughout the nesting season, traps are then moved depending on where the depredation is occurring at the time. Trapping of raccoons is accomplished by the CCAFS pest management contractor. Removal of raccoons on CCAFS is coordinated with both state and federal agencies, including with Animal and Plant Health Inspection Service (APHIS).

Similarly, trapping raccoons also occurs on PAFB beaches in support of the sea turtle program. Sea turtles are monitored daily on PAFB beaches, and oversight of the monitoring program is provided by 45 CES/CEIE-C. Trapping on PAFB is the responsibility of the CE Operations Pest Shop through a job order request by 45 CES/CEIE-C.

7.2.2.2 Feral Hogs

Feral hogs damage improved grounds, create a hog/vehicle or hog/aircraft strike hazards, and can impact the survival of federal and state listed species. They emigrate from KSC by way of a shared boundary. The feral hogs are descendants from the original population kept by previous landowners on Merritt Island. Since feral hogs are not an indigenous species on CCAFS and inflict significant damage to the 45 SW resources, the USAF has implemented an ongoing hog removal program.

In 1985, the CCAFS Security Police supported the sea turtle preservation program by hunting feral hogs. Selective hunting of offending feral hogs did not significantly reduce the overall population. To address this problem, the USAF contracted the CCAFS Security Police to remove 300 hogs installation-wide in 1987; nearly 200 hogs were removed from CCAFS during this period. Although short of the initial goal of 300 animals, the removal effort was sufficient to significantly reduce the CCAFS feral hog population and corresponding depredation of sea turtle nests.

In addition, an agreement between the USAF and Florida Hog Hunters Association (FHHA) initiated in 1986 facilitated hog population control efforts on CCAFS. Feral hog numbers on the station were significantly reduced by 1988 and hunting efforts by FHHA decreased correspondingly. The FHHA has periodically trapped and removed hogs, with the average trip netting approximately 1-2 hogs.

Removal of hogs is now conducted throughout the year (within CCAFS) by a USAF contractor. The goal is 100% eradication/control of hogs. Depredation of sea turtle nests due to feral hogs

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has been reduced significantly over the years, and is now rarely observed, due to more rigorous observational reporting and immediate dispatch of animals.

7.2.2.3 Coyotes

In the early 2000s, coyote tracks were observed on the beach although predation of sea turtle nests was not documented. The 45 CES/CEIE-C natural resource personnel conducted a coyote scent survey for two years in accordance with methodology provided by the University of Florida. The results of this scent survey resulted in no sign of coyotes even though they were known to be present. In 2003, 45 CES/CEIE-C personnel observed coyote tracks on the beach, but again predation on nests was not documented. In 2005, coyotes began depredating sea turtle nests in small numbers (<1% of nests). In 2006, numerous tracks were seen and predation on nests became significant enough to institute a coyote trapping program. The trapping program removed three coyotes and predation ceased. Over the past few years, the coyote population has become well established and an ongoing problem. MINWR controls coyote only during the sea turtle nesting season, and the coyotes observed on CCAFS are likely coming from the National Wildlife Refuge. Similar to raccoons and feral hogs, coyote removal is conducted by a nuisance wildlife contractor using padded leg traps. Occasionally an animal is shot on sight during routine patrols. According to data maintained by the 45 CES/CEIE-C since 2011, an average of five coyotes has been removed per year, which is not sufficient to lower coyote depredation of sea turtle nests. The 45 CES/CEIE-C is researching other avenues to increase the capture rate of coyotes within CCAFS.

7.2.2.4 Africanized Honey Bees

AHB have made their way into the State of Florida, breeding and competing with the European honey bees that normally inhabit Florida. Although frequently described as "aggressive," this behavior is actually defensive. The AHB react when people get too close to a nesting colony of AHBs. Potential nesting sites may include:

- Abandoned vehicles
- Empty containers
- Places with holes
- Fences
- Lumber piles
- Manholes
- Water meters
- Utility infrastructures
- Old tires
- Trees
- Garages
- Outbuildings
- Sheds
- Walls
- Chimneys
- Crawl space under buildings

According to 45 CES/CEIE-C personnel, pest control and grounds maintenance personnel have encountered AHBs on several occasions; however, no life threatening injuries were sustained to date. During land management activities, one USAF contractor staff person encountered an AHB bee hive, was stung over 70 times, and required medical attention [occurred in Land Management Unit (LMU) 89]. Based on the defensive nature and the distance these bees

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pursued the worker, these bees were believed to be AHBs, but tests were not conducted to confirm. Currently, the 45 SW does not have access to the biological testing needed to determine bee species, so technicians use behavioral observations in order to identify AHBs. Generally speaking, AHB become highly aggressive within a 20 foot radius of their hive, and respond immediately to any threat. These bees operate in larger swarms than European honey bees and will chase a victim up to 1/4 mile (Shane Russell. 2014. Personal communication).

The best defense is to remove or block potential nesting sites. Swarming season occurs from March to July. If bees are found nesting, contact the pest management contractor. The Florida Department of Agriculture and Consumer Services (FDACS) recommends all wild bee hives be exterminated by certified pest control operators (UF Institute of Food and Agricultural Sciences [IFAS] 2014). Personnel will follow standard protocol if AHBs are encountered in the field.

7.2.2.5 White-tailed Deer

In 1983, the CCAFS white-tailed deer herd was estimated to be as high as 1,500 individuals and above carrying capacity (INRMP 1997). These high deer densities created a safety hazard to vehicles traveling on CCAFS roads and resulted in significant vehicle strikes on CCAFS. As a result, there was a culling of the deer herd. Between 1972 and 1980, the FWC trapped deer on CCAFS and relocated them to enhance deer populations elsewhere in the state. Vehicle strikes increased through the 1980s reflecting an assumed increase in herd size after deer relocation was suspended. The FWC suggested a special public hunt on CCAFS, but safety and security concerns prohibited this activity.

The primary method of controlling the deer population was shooting animals observed on the road shoulders. Security personnel were tasked to hunt and remove deer from CCAFS road shoulders. Animals grazing on road shoulders, referred to as “offending deer,” were considered most likely to be involved in vehicular accidents. The shooting was expected to dissuade other deer from using the heavily traveled roads. As many as 74 accidental deer-vehicle collisions occurred in a single year on CCAFS (1985). Starting in 1984, CCAFS received a FWC permit to shoot 100 deer annually. This increased to 200 deer annually from 1985 to 1987, and to 300 deer annually from 1988 to 1990. However, actual deer harvest levels for 1989 and 1990 were significantly lower than previous years (122 deer harvested in 24-month period). After 1990, wildlife control officers and security police reported a marked decrease in deer observed along road shoulders. Deer harvests were discontinued after 1990.

A pilot project was initiated in 1983 that installed 190 Swareflex reflectors at intersections with reported high numbers of deer-vehicle strikes. The intersection of South Cape Road at the Lighthouse Road intersection was the site of the most accidents within CCAFS. Within a year after the reflectors were installed, deer strikes at that location decreased by greater than 75 percent. Due to the effectiveness of the reflectors, additional reflectors were installed at the Pier Road and Flight Control Road intersections. In 1991 all the reflectors were removed due to deterioration of the reflective surfaces of many of the devices.

Installation-wide deer-vehicle collision incidents within CCAFS have remained low since 1990 and appear to continue to decline. In the future, if deer removal becomes necessary, harvest levels will be based on a deer surveys to ensure informed management decisions and

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appropriate hunting goals. Test surveys were conducted in 1999 using a helicopter and Forward Looking Infrared (FLIR) video system. These surveys revealed very low numbers of deer within CCAFS (maximum count: 47 deer). In 2000, night-time spotlight counts documented a maximum number of 56 animals during one spotlight count during July. The average number of animals seen was 42.8 with a range of 36 to 56 deer. Annual surveys continued through 2002 with similar results, but were discontinued after 2002 since there was no valid justification for continuing and deer-vehicle collisions were low. In 2011, after a slight increase in deer-vehicle collision incidents, natural resource personnel conducted another survey to determine if there were areas on major roadways with higher numbers of deer. Those surveys produced similar results as the earlier ones; the highest number of deer observed in a single night was 17. Surveys have not been conducted since 2011; however, the 45 CEC/CEIE-C will continue to conduct deer census on an as needed basis to determine if management actions are required, preferably in the July/August timeframe. The surveys will be conducted during the full moon phase to help observers distinguish between male and female individuals. The surveys will yield relative abundance data that can be used to detect trends in the deer number and composition over time.

7.2.3 Injured Wildlife

Occasionally, injured wildlife are found within the 45 SW installations. The 45 CES/CEIE-C responds to calls regarding injured wildlife, and attempts to capture the animal and transport the injured animal. A log of injured wildlife is maintained by 45 CES/CEIE-C. In the event the CE Operations Pest Shop receives calls about injured or dead wildlife within 45 SW properties, the pest shop will coordinate with the 45 CES/CEIE-C.

The normal procedure for injured wildlife encountered on 45 SW properties is to transport the wildlife to the nearest animal rehabilitation center for care. Injured birds of prey are transported to the Audubon of Florida Center for Birds of Prey in Maitland, Florida. Stranded mammals and injured sea turtles are reported to the FWC hotline. The 45 CES/CEIE-C has a permit to handle/transport sea turtles that are dead or injured. If immediate dispatch is necessary the USAF nuisance wildlife contractor personnel will ensure humane treatment of the animal (see **Section 7.4**). Installation security is occasionally requested to dispatch an animal hit by a vehicle in the middle of the night if the animal is beyond saving.

Diseases affecting fish and wildlife may occur on the installation. Any large-scale fish and wildlife deaths and unnatural behavior occurring on the installation will be reported, recorded and investigated, in conjunction with USFWS, NMFS, US Department of Agriculture (USDA)-WS and FWC personnel, as appropriate.

7.2.4 Hunting, Trapping and Fishing

CCAFS has as targeted trapping/removal program to reduce impacts to T&E species, as discussed above in **Section 7.2.2**. Deer management has historically occurred on CCAFS. However, no recreational hunting or trapping is conducted on CCAFS, PAFB, MTA or JDMTA. Furthermore, the cultivation of food plots for wildlife is not conducted on the 45 SW properties.

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PAFB provides public access to the beaches on the Atlantic Ocean, where fishing is authorized under the jurisdiction of FWC. In addition, the 45 SW offers recreational fishing opportunities to badged personnel along the Banana River at PAFB and within designated fishing areas on CCAFS. Recreational fishing is not provided on MTA or JDMTA. Fish populations are not managed on the 45 SW properties.

The 45 SW does not have general open public access for recreational hunting, trapping, or fishing for the reasons.

- CCAFS has a mission that prevents open public access due to safety and security risks.
- CCAFS has some wildlife that could support a hunting program, but it is unlikely that an organized hunting program with special groups would provide sufficient population benefits to outweigh the logistical requirements of such a program.
- PAFB, MTA and JDMTA have insufficient wildlife resources for sustainable hunting.
- PAFB does not authorize fishing in the ponds and canals on the golf course or in other portions of the property due to safety concerns (e.g., airfield clear zone)
- PAFB has a mission that limits open public access to the Banana River shoreline and Marina due to safety and security concerns.
- MTA is surrounded by residential/commercial development, thus hunting is not a compatible activity with the surrounding area.
- JDMTA houses launch tracking equipment that is too sensitive for open public access and is too small (11 acres) to support a hunting program.

CCAFS Fishing Program: Fishing is allowed within CCAFS, but only for individuals with permanent access badges to CCAFS and to KSC employees (and up to four guests) in designated areas within CCAFS. This limitation is necessary due to the nature of the CCAFS mission. Currently, there are five fishing areas within CCAFS:

1. Beach fishing area located at Camera Road A.
2. Beach fishing area located at Camera Road B.
3. Beach fishing area located at the former Launch Complex 47 (pending approval for this location)
4. Banana River access located just south of Hangar AF in the Industrial Area.
5. Designated fishing area located at the Trident and Poseidon wharfs (controlled by NOTU).

Fishing is authorized during daylight hours only, as launch operations permit. Fishing on the beach is allowed on a 0.25 mile stretch north and south of the designated access points. Personnel are required to follow the Fishing/Beach Access Rules for CCAFS, which are included in **Appendix I**. In addition to these fishing rules, personnel are required to abide by all Florida fishing rules and ensure they have any proper permits/stamps required. Currently, there are no fees collected for fishing on CCAFS. Fishing areas are occasionally closed during launch related operations and during heightened security conditions.

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The 45 CES/CEIE-C will inspect beach/fishing access areas at CCAFS after use to ensure there are no adverse impacts to fish or wildlife. Maintenance activities are implemented as appropriate.

PAFB Fishing Program: PAFB has 4.1 miles of Atlantic Ocean shoreline and 4.6 miles of Banana River shoreline which provides opportunities for salt water fishing. Fishing is allowed for the general public along the PAFB Atlantic Ocean beach. Personnel with authorized access to PAFB may also fish along the Banana River shoreline. All fishing is required to be conducted IAW state fishing laws and regulations. Fishing is not authorized within the ponds and canals on the PAFB property due to safety and BASH concerns. Regulations related to fishing activities for PAFB are provided in **Appendix I**.

7.3 Outdoor Recreation and Public Access to Natural Resources

Primary Regulatory Drivers

- SAIA
- AFI 32-7064
- AFI 34-110

Outdoor recreational opportunities are limited due to the environmentally sensitive nature of the 45 SW unimproved lands and mission safety and security concerns. As defined by AFI 32-7064, there are no "Open Areas" that have unrestricted access to the public for outdoor recreation with the exception of PAFB's recreational beaches along the Atlantic Ocean. "Restricted Areas" exist within CCAFS and PAFB for badged personnel and their guests for a limited number of recreational activities. Outdoor recreation is not authorized at MTA and JDMTA due to its restricted status. Hunting, trapping and fishing at the 45 SW properties is discussed in **Section 7.2.4**. A brief description of other outdoor recreational opportunities at CCAFS and PAFB are provided in the following sections.

AFI 34-110 (*Air Force Outdoor Recreation Programs and Procedures*) implements Air Force Policy Directive (AFPD) 34-1 (*Air Force Services Combat Support Programs*), and provides guidance for managing USAF outdoor recreation facilities and programs. The overall goal of the recreation program is to provide for specific types of recreational activities on PAFB and CCAFS, including picnic facilities; a family camping area; fishing, boating, golfing, jogging, and biking activities; enjoyment of scenic natural and historic areas; and outdoor adventure activities such as wakeboarding, surfing, kayaking, horseback riding, and diving. However, due to access limitations, the recreational program at CCAFS has a much more limited potential audience than what is allowed at PAFB. A copy of the Outdoor Recreation Management Plan (ORMP) for CCAFS and PAFB is included in **Appendix I**.

7.3.1 CCAFS

Demand from the public for outdoor recreational use at CCAFS is low due to the ample recreational opportunities available at the natural areas adjacent to the installation, which include MINWR, the Canaveral National Seashore, and Port Canaveral. Personnel that are authorized access to CCAFS have use of established jogging paths, and various outdoor courts for tennis, volleyball, racquetball, and basketball. The Bourne Pavilion, located behind the CCAFS Commanders Office in the Industrial Area, has areas for barbecues, horseshoes, and a softball field.

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Badged personnel may also walk/jog on CCAFS beaches by accessing the beaches via dune crossovers at Camera Road A and Camera Road B only. KSC beaches are off limits. Mountain biking, ATVs and other off-road vehicle use in not permitted on the installation due to the environmentally sensitive nature of the majority of the unimproved grounds.

Natural resource managers, in coordination with security personnel, routinely monitor the outdoor recreational activities at CCAFS for compliance with security and natural resource management policies. Personnel visit beach access points, Port fishing areas, and jogging areas to document litter, unauthorized use, and impacts to natural resources. This monitoring ensures that outdoor recreation activities do not negatively impact the installation's natural resources. If natural resources are negatively impacted from outdoor recreational, these opportunities may be curtailed.

7.3.2 PAFB

As mentioned in Section 7.3, the public has access to PAFB's beach along the Atlantic Ocean unless elevated security or safety conditions require closure of beach access. Personnel with authorized access to PAFB can also utilize the 4.6 miles of Banana River shoreline (western boundary of PAFB) for wind surfing, boating, fishing and water sports. PAFB also has five picnic areas (two near the beach, two near the river and one associated with the Yacht Club). The Family Camping (FAMCamp) grounds near the Banana River is heavily utilized by retirees, and also contains a primitive camping area for Boy and Girl Scout activities when coordinated with a base employee. The Manatee Cove Marina, on the Banana River side of PAFB, provides wet slips and a picnic pavilion near the Outdoor Recreation facility. The associated Yacht Club provides dining for active and retired military persons, their dependents, eligible guests, and DoD civilians.

Mountain biking and off-road vehicle use are not permitted on the installation due to the developed nature of the Base. However, road and bike path cycling is permitted with PAFB. Use of off-road vehicles (ATVs) is authorized within PAFB by licensed drivers that are in 45 SW Security Forces and Conservation (CEIE) when conducting security patrols and wildlife surveys. Segway Personal Transporters (segways) and beach equipment rentals are used on PAFB beach, but under rules established during USFWS consultation. Segways are used infrequently and are generally under supervision by the 45 SW Force Support Squadron (FSS) as a guided tour that has a limited range on the beach north and south of the Beach House.

Outdoor recreation facilities are operated seven days per week at PAFB. The 45 SW Force Support Squadron (45 FSS) manages reservations for activities in designated areas. Persons authorized to use the PAFB outdoor recreation facilities include active duty, retired military, DoD civilian, and others by special permission of the 45 SW/CC. Fees are collected by 45 FSS and included in Non-Appropriated revenue. For more information on PAFB recreational opportunities, refer to the ORMP in **Appendix I**.

7.4 Conservation Law Enforcement

Primary Regulatory Drivers

- SAIA
- DoDI 5525.17

DoDI 5525.17 (Conservation Law Enforcement Program [CLEP]) establishes policy, assigns responsibilities, and

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provides direction for the CLEP, and defines the organization and authorities of the CLEP. The CLEP's mission is to enforce applicable Federal and state laws and regulations for the purpose of protecting natural and cultural resources and sustaining military lands and operations.

Previously, the 45 CES/CEIE-C had a full-time staff member designated as a CLEO who was responsible for carrying out this program for the 45 SW. The CLEO was responsible for employing certain law enforcement actions such as warnings, citations, complaints, or arrests to comply with laws and regulations when voluntary compliance failed. However, this position was recently lost.

Currently, the 45 SW does not have a CLEP. The 45 SW/CC and federal and state conservation officers are responsible for enforcing natural and cultural resources laws and regulations on CCAFS, PAFB, MTA and JDMTA. One of the 45 SW's management actions over the next 5 years is to investigate how the 45 SW will re-establish and maintain the CLEP in the future without a full-time CLEO position.

7.5 Management of Threatened and Endangered Species and Habitats

This section presents information about the management of threatened, endangered, and other rare species that are documented on 45 SW properties. The 45 SW is required to manage federal and state listed T&E species. Failure to protect federally listed species could lead to an ESA violation, which could negatively impact training land availability. Furthermore, the 45 SW natural resource managers also recognize state-listed species when evaluating potential impacts to the quality of their habitat IAW AFI 32-7064. To date, numerous BOs have been issued by the USFWS for operations at the 45 SW installations; non-compliance with the BOs is a violation of the ESA. Current BOs for the 45 SW are summarized and included in **Appendix B**.

Primary Regulatory Drivers

- Endangered Species Act
- Marine Mammal Protection Act
- Bald and Golden Eagle Protection Act
- AFI 32-7064
- Florida Manatee Sanctuary Act
- Florida Endangered and Threatened Species Act (Chapter 379.2291, F.S.)
- FAC 68A-27.003 and 68A-27.005
- FAC 5B-40

No federally designated critical habitat under Section 4 of the ESA is mapped on the installation; however, critical habitat for West Indian manatees is mapped within the Banana River and along the Atlantic Coast (USFWS 2014f). Similarly federally designated critical habitat for the North Atlantic right whale is mapped along the Atlantic Coast as well (USFWS 2014f).

The 2004 amendments to the ESA included provisions to exclude designated critical habitat on DoD lands. Section 4(a)(3)(B) is not discretionary and mandates that the Secretary of Interior exclude designating critical habitat on "any lands or other geographical areas owned or controlled by the DoD, or designated for its use, that are subject to an INRMP prepared under Section 101 of the SAIA, if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation." This applies to the final designated critical land habitat for the loggerhead sea turtle (nesting beaches).

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NMFS proposed critical in-water habitat areas on the Atlantic Ocean for the loggerhead sea turtle; these critical in-water habitat areas were finalized by NMFS on 10 October 2012 (79 FR 39756, 39805). Since the DoD does not own these in-water habitats, the 45 SW is not exempt from the critical in-water habitat designation. USFWS did exempt CCAFS and PAFB beaches from the terrestrial loggerhead critical habitat designation.

Of the 133 listed animal species and 561 listed plant species in Florida (Gruver and Murphy 2013, Weaver and Anderson 2010), 43 species protected under the ESA and/or Florida law are known to occur on CCAFS, PAFB, MTA and/or JDMTA or in adjacent waters (see **Table 5-5**), and 19 of these species are considered 'high' or 'medium' priority management species, as described in **Section 5.4**. Species include six birds, one fish, three mammals, eight reptiles, and one plant.

As described in **Section 4.1.3**, climate change is likely to increase the variability of precipitation and increase water temperature in Florida. Due to the increasing sea level, coastal areas and species may be dramatically affected. T&E species are already restricted in range or habitat use and rapid climate change, combined with habitat fragmentation, may make it difficult for many of these species to adapt. Sea turtles might be particularly affected as gender is determined by nest temperature. The 45 SW will continue to work with USFWS, NMFS and FWC to identify ways to protect and mitigate for the effects of climate change on T&E species.

This Section of the INRMP focuses on the management requirements of special status species identified as 'high' and 'medium' management species on the 45 SW installations. Species-specific management plans and fact sheets for several of these species are included in **Appendix C** for additional information. Priority species were identified based on their regulatory status, and known occurrence at CCAFS, PAFB, MTA, and JDMTA. High priority species include federally listed species with management plans (see **Appendix C**), Biological Opinions (BO) and incidental take permits (see **Appendix B**), and/or which are directed managed by 45 SW with projects undertaken specific for them. Medium priority species include federally listed species known to occur on at least one of the 45 SW installations; however, these species are not typically directly managed by 45 SW nor are projects undertaken directly by 45 SW to support these species, although protection measures are often used to reduce potential impacts.

7.5.1 High Priority Management Species

High priority was given to federally listed species on the 45 SW installations that require more extensive management efforts. These species typically have a current BO associated with them and/or site specific management plan. High priority management species are listed below and management of these species is included in the following subsections.

- Federally threatened loggerhead sea turtle
- Federally endangered green sea turtle
- Federally endangered leatherback sea turtle
- Federally endangered hawksbill sea turtle

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- Federally endangered Kemp's ridley sea turtle
- Federally threatened Florida scrub jay
- Federal candidate and state threatened gopher tortoise
- Federally threatened eastern indigo snake
- Federally threatened Southeastern beach mouse
- Federally endangered Florida perforate lichen

7.5.1.1 Sea Turtles

Five federally listed sea turtles occur on or in the water adjacent to CCAFS and PAFB. The federally endangered hawksbill sea turtle and Kemp's ridley sea turtle are not known to nest on the 45 SW installations, but could occur in the water adjacent to them. The remaining three sea turtles (loggerhead, Atlantic green, and leatherback) nest on the shores of both CCAFS and PAFB between March and October. Each year, between 1,400 to 3,600 sea turtle nests are deposited on the CCAFS, while between 600 and 2,000 nests are deposited on the PAFB beach. The loggerhead turtle is the most common nesting sea turtle on CCAFS and PAFB. Medium to high quality sea turtle habitat is present within CCAFS and PAFB.

After discussion with USFWS, an exemption was granted on 10 October 2012 by USFWS (USFWS 2012) to the 45 SW allowing 45 SW properties (CCAFS and PAFB) be exempt from the critical habitat designation on land for the loggerhead sea turtle (79 FR 39756, 39805). This exemption was granted by USFWS because the 45 SW management practices include measures that provide a benefit to the conservation of loggerhead sea turtles, and all sea turtles (nests, eggs, and hatchlings). These management practices and additional information regarding this exemption can be found in **Appendix C, Attachment C-1**). Since the DoD does not own in-water habitats, the 45 SW is not exempt from the critical in-water habitat designation.

In 1986, the 45 SW began sea turtle monitoring at CCAFS and PAFB. Since the sea turtle program began, the 45 SW management techniques have been modified and improved. The overall program has been expanded to include: predator control, exterior light management, sea turtle walks and education, rescue and release of hatchlings, daily nest surveys, stranding and salvage activities, nest relocation, and participation in the FDEP Index Nesting Beach Survey. This Index Nesting Beach Survey (INBS) program was designed to provide an index of sea turtle population trends through standardized sampling of selected nesting beaches. This long-term, systematic program provides high quality data from nesting beaches around the state. Continued participation in this program is crucial in the determination of the recovery of T&E sea turtles. All activities are permitted by the FWC and conducted IAW the ESA and site-specific BOs. The 45 SW is committed to continued participation in the INBS/SNBS and hatchling productivity programs; and 45 SW leadership continues to support these programs. For detailed information on the history, abundance and management of sea turtles at CCAFS and PAFB, see the *45 SW Sea Turtle Management Plan* in **Appendix C, Attachment C-1** and the relevant BOs in **Appendix B**.

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Management Guidelines: The following management measures will be implemented to manage sea turtle populations at CCAFS and PAFB and contribute to their recovery:

- Conduct annual sea turtle surveys (Index and State Nesting Beach Surveys) along the CCAFS and PAFB beaches and in Trident Basin (study by University of Central Florida) to monitor the effect of 45 SW and other tenant operations and to provide long-term sea turtle population trends.
- Continue annual productivity data collection
- Perform disorientation surveys daily for adults and hatchlings and report all incidents using the FWC Marine Turtle Disorientation Report form.
- Carry out night surveys when disorientation incidents become a recurring problem at a particular location or when a light source cannot be identified;
- Deploy portable light shields, when necessary, to reduce hatchling disorientation;
- Protect sea turtle nests from predation, as needed, with welded fence wire;
- Relocate nests deposited in poor locations (below high tide, behind the dune);
- Participate in stranding and salvage activities;
- Conduct trapping when predation is noted;
- Conduct biannual beach cleanups;
- Stabilize dunes by planting native vegetation and installing sand fences;
- Conduct beach renourishment and rubble removal projects;
- Continue educational efforts and signage for 45 SW leadership, personnel, users and the public;
- Maintain appropriate trash receptacles at CCAFS and PAFB;
- Conduct periodic light surveys IAW the BO (see **Appendix C**);
- Comply with 45 SWI 32-7001 (*Exterior Lighting Management*);
- Stage equipment on the PAFB beach as required to minimize impacts;
- Relocate sea turtle nests only as the last resort and IAW the FWC Marine Turtle Conservation Guidelines (FWC 2007); and
- Avoid sea turtle nesting/hatching season when implementing dune and beach restoration and enhancement projects (see **Sections 7.8** and **7.14**).

7.5.1.2 Florida Scrub-Jay

The Florida scrub-jay is habitat-specific and depends on the availability of Florida scrub for its survival. Due to a loss of optimal scrub habitat resulting from the disruption of natural fire cycles and land clearance and development activities, the populations that remain in Florida are small, demographically isolated, and likely to decline. A core population is defined as a contiguous population that exceeds 400 territorial pairs; six Florida scrub-jay core populations in Florida remain. The CCAFS/KSC/MINWR populations represent one of the six core populations.. The CCAFS scrub-jay population is considered part of the larger meta-population that includes birds

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on Merritt Island (KSC and the Canaveral National Seashore) (USFWS 2013). The estimated state-wide population is 7,000 to 11,000 scrub-jays, and it is estimated that approximately half of the scrub-jays can be found within the MINWR/CCAFS complex. Considering the importance of the CCAFS scrub-jay population for maintaining stable statewide population, special consideration and management of this species and its habitat is required. Good quality habitat is available for the scrub-jay within CCAFS.

The scrub-jay does not inhabit the other three 45 SW installations. However, the JDMTA is surrounded by the JDSP on three sides. The scrub-jay does inhabit the state park, but no nests have been observed within JDMTA; the scrub-jay is known to use JDMTA for caching acorns.

Construction of new facilities and expansion of existing facilities on CCAFS are periodically needed to meet mission requirements. Since about half of CCAFS is or could be restored to scrub, the preferred scrub-jay habitat, many land clearing activities have the potential to adversely impact scrub-jays and their habitat. The removal of scrub habitat associated with construction activities within CCAFS is the primary threat to the CCAFS scrub-jay population. In addition, the operation of motorized vehicles on CCAFS is a potential source of mortality for scrub-jays within CCAFS. Much of the suitable habitat on CCAFS is adjacent to major roads that are heavily utilized during early morning and late afternoon hours. Those peak traffic hours correspond to the scrub-jay's most active periods. Detailed discussion on habitat requirements, suitable habitat at CCAFS, and the management of the Florida scrub-jay is included in the *45 SW Florida Scrub-jay Management Plan* (see **Appendix C**).

Management Guidelines: Management actions for scrub-jays on CCAFS are primarily oriented toward habitat improvement. The following management measures will be implemented for Florida scrub-jays at CCAFS and contribute to their recovery:

- Avoid construction during the scrub-jay nesting season from March 1 through June 30 to the maximum extent practicable;
- Ensure prior to clearing of occupied scrub-jay habitat that there is suitable habitat within 1200 feet;
- Maintain mowed grass areas along roads and facilities;
- Maintain and restore scrub habitat utilizing prescribed fire and mechanical clearing to prevent possible succession into a xeric hammock and scrub height reaching unsuitable levels accordance with the *45 SW Scrub Habitat Restoration Plan* (see **Appendix C, Attachment C-3**);
- Implement scrub-jay habitat avoidance, minimization and compensation measures IAW the *45 SW Florida Scrub-jay Management Plan* (see **Appendix C, Attachment C-2**);
- Control invasive species in areas that have been restored;
- Monitor scrub-jay numbers to determine effects of management recovery efforts;
- Band individuals to assist with defining family groups and monitoring dispersal of birds; and
- Conduct annual censuses to gain better insights on the minimum habitat size, basic biology, and current distribution of the scrub-jay within CCAFS.

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In addition to mitigation and restoration on CCAFS, the 45 SW also participates in the Readiness and Environmental Protection Initiative (REPI) which obtains easements on other lands in partnership with the Brevard County Environmentally Endangered Lands Program to preserve viable FL Scrub-jay habitat for potential future credits if scrub restoration on CCAFS no longer supports the number of scrub-jay groups expected by USFWS.

7.5.1.3 Gopher Tortoise

The gopher tortoise is a federal candidate species for listing as a threatened species and a state-listed threatened species that is typically found in dry upland habitats, such as sandhill, scrub, and pine flatwoods. Medium to high quality habitat is available for the gopher tortoise within CCAFS, MTA, and JDMTA. Gopher tortoises excavate deep burrows for refuge from predators, weather, and fire (Hipes et al. 2000). The gopher tortoise is considered a keystone species because their burrows provide refuge for more than 300 animal species that neither harm nor benefit the gopher tortoise, including listed species such as the eastern indigo snake, Florida pine snake, Florida mouse, and gopher frog [Florida Department of Military Affairs (FDMA) 2011].

As a response to the listing petition received by the USFWS in 2006, stakeholders (i.e., agencies, DoD, and others) in Florida, Georgia, Alabama, and South Carolina developed a CCA. The gopher tortoise occurs on CCAFS, PAFB, MTA and JDMTA. As such, the 45 SW is an active participant in the CCA, and is required to prepare an annual assessment report to document conservation activities on an annual basis.

Permitting: Per the FWC (2012) *Gopher Tortoise Management Plan*, military activities are exempt from obtaining permits and paying permit fees; therefore, the 45 SW is no longer required to obtain a permit from FWC for gopher tortoise relocations.

Management Guidelines: Gopher tortoises are vulnerable to several threats within their range, including habitat degradation and loss (FWC 2010). Through appropriate habitat management, the 45 SW will manage existing high quality habitat as well as improve and restore degraded habitat in xeric uplands and natural communities that support the gopher tortoise. Maintaining these communities in a manner that replicates their natural form and function helps ensure they meet the needs of the gopher tortoise and the other species dependent on these communities. The following management actions are recommended:

- Participate in CCA and complete annual report;
- Avoid relocating gopher tortoises when possible;
- Implement the *45 SW Gopher Tortoise Relocation Plan* included in **Appendix C, Attachment C-4** when relocating gopher tortoises is necessary;
- Maintain a 25-foot boundary (at a minimum) around all gopher tortoise burrows within the vicinity of projects and 45 SW operations that have the potential to collapse burrows;
- Identify these burrows with high visibility signs indicating the 25-foot boundary where gopher tortoises will not be relocated during a project or 45 SW operations; and

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- Control invasive and exotic species and noxious weeds through early detection, isolation of infested areas, and control of individual plants with physical, chemical, or mechanical means, depending on the species.

7.5.1.4 Eastern Indigo Snake

The eastern indigo snake uses a wide range of habitats including scrub, sandhill, and wetland habitat. However, this snake requires large tracts of land to survive. This snake is known to use gopher tortoise burrows (see below) as a refuge from the elements, including cold temperatures and fire, but is also known to take refuge in stump holes. In northern Florida, it winters mostly in gopher tortoise burrows (Hipes et al. 2000).

Due to the presence of gopher tortoise burrows on 45 SW lands, it is possible the eastern indigo snake is present on CCAFS, PAFB, MTA and JDMTA. The indigo snake has been observed on CCAFS and MTA. However, evidence of this species has not been observed on 45 SW properties in more than five years. According to the 45 CES/CEIE-E, the indigo snake has not been documented utilizing gopher tortoise burrows on CCAFS, based on scoping and excavation of more than 1,000 burrows. The 45 SW plans to undertake a survey in the future specifically for the indigo snake.

Management Guidelines: Eastern indigo snakes are threatened due to habitat loss and degradation resulting from land clearing activities, vehicular traffic, and other development. The 45 SW installations contain a large amount of suitable habitat. The following management actions are recommended for this species at the 45 SW installations:

- Obtain a better understanding of overall population abundance and distribution within the 45 SW installations by implementing a multi-year survey and the new USFWS survey protocols for eastern indigo snakes;
- Protect large areas of suitable habitat;
- Avoid construction of new roads within contiguous habitat;
- Adhere to the USFWS *Standard Eastern Indigo Snake Protection Measures* when conducting construction or other land disturbing activities and obtain permits as necessary;
- Maintain gopher tortoise populations, and protect gopher tortoise burrows and dead stumps as they are used as den habitat;
- Contact the 45 CES/CEIE-C if it is determined an indigo snake needs to be relocated;
- Implement vegetation management strategies discussed in **Section 7.9**; and
- Educate site users to prevent collection or harm to these snakes, and provide Indigo Snake Education Plan to contract managers prior to initiation of projects.

7.5.1.5 Southeastern Beach Mouse

The SEBM is a federally listed threatened species. It is a sub-species of the numerous, widely distributed old field mouse. Currently, no critical habitat for SEBM has been designated. Generally speaking, SEBM populations are restricted to the coastal dune and coastal strand

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communities along Florida's East Coast. Human alteration of the coastal barrier islands has resulted in extirpation of SEBM from the majority of its range. The most viable populations are now located on federal lands, including the Canaveral National Seashore, MINWR/KSC, and CCAFS. Medium to high quality habitat is available for the SEBM within coastal dune/strand areas of CCAFS. Historically, SEBM populations within CCAFS and PAFB were restricted to the coastal dune and coastal strand communities, but further research has shown that SEBM are located in interior oak scrub sites, as well as in buildings. Studies conducted in the vicinity of LMU-40 at CCAFS indicate a large and healthy population of SEBM residing in coastal dune/strand and disturbed oak scrub communities in this area. Live trap studies were conducted at PAFB in the 1990s and again in the early 2000s with no captures of SEBM (Oddy et al. 1999); it is assumed there are no longer viable SEBM populations within PAFB due to habitat fragmentation and isolation. CCAFS is the only 45 SW property with the potential for SEBM.

Management Guidelines: The SEBM has the potential to be impacted during construction or other land clearing activities, prescribed burns, and pest control operations. The 45 SW currently has a Programmatic BO that addresses impacts associated with temporary disturbances to SEBM for projects that do not result in a permanent removal of habitat such as scrub restoration activities, installation of utility lines, soil remediation, etc. (see Appendix B). Several years ago, SEBM were discovered inside several facilities and there was concern with pest control operations having adverse impacts to SEBM. As a result, the 45 SW requested and received a Programmatic BO that covers pest control operations in an area that has been defined as being east of Pier Road, Lighthouse Road, ICBM Road and North Phillips Parkway (see Appendix B). All rodent pest control in these areas must be accomplished using live traps. All SEBM captured must be safely released outside the facility. Although this BO is several years old, it is still considered valid; the 45 SW is currently working on updating the BO with USFWS. The following management actions will be implemented in areas where the SEBM may be found on CCAFS:

- Consult with the 45 CES/CEIE-C prior to initiating projects that require digging;
- Protect coastal dune and strand communities;
- Adhere to the SEBM BO for disturbance activities; and
- Use live traps when conducting pest control measures along those coastal areas defined above.

7.5.1.6 Florida perforate lichen

The Florida perforate lichen (lichen) is a federal and state listed endangered plant species. The lichen is found in well-drained sands of scrub in only a few locations in Florida. Currently, no critical habitat for the lichen has been designated. The lichen is present only at the JDMTA property of the 45 SW. The population found within JDMTA is part of a larger population at JDSP, located adjacent to JDMTA. In 2005, the lichen at JDMTA was relocated to an offsite location within JDSP through coordination with the JDSP biological staff under a USFWS BO (7 Feb 2005) for a JDMTA fence and tower replacement project. The lichen at JDMTA was almost entirely limited to the maintained open areas at the fence line, particularly in the area of

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the boresight tower. Only fragments of the lichen that were too difficult to retrieve/remove still remain on JDMTA.

Management Guidelines: The Florida perforate lichen is endangered due habitat loss and degradation resulting from land clearing and conversion activities as well as frequent or catastrophic fires (FNAI 2014). The following management actions are recommended for this species at JDMTA:

- Conduct periodic surveys at JDMTA to determine if new populations of the lichen have established and
- Consult with the 45 CES/CEIE-C prior to initiating projects in areas where any remaining lichen may be found.

7.5.2 Medium Priority Management Species

Medium priority was given to all remaining federally listed species known to occur on or near the 45 SW installations. While these species do not currently have extensive on-site management or species-specific management plans associated with them, these species are protected under the ESA. As discussed above, the 2004 amendments to the ESA include provisions to exclude critical habitat designations on DoD lands. It is the 45 SW's intent to manage all federally listed species in a beneficial way to avoid a critical habitat designation on their properties.

- American alligator (treated as federally threatened)
- Federally endangered Atlantic sturgeon
- Federally endangered smalltooth sawfish
- Federally endangered West Indian manatee
- Federally endangered North Atlantic right whale
- Federally threatened wood stork
- Federally threatened roseate tern
- Federally threatened piping plover
- Federally threatened red knot
- Federally protected bald eagle

7.5.2.1 American Alligator

The American alligator is listed as threatened by USFWS due to its similarity in appearance to the federally endangered American crocodile (*Crocodylus acutus)*. The American alligator inhabits fresh and brackish marshes, ponds, lakes, rivers, swamps, bayous, and large spring runs. The four 45 SW installations contain habitat typically used by the alligator.

Management Guidelines: Although this species was once in danger of extinction, it was declared fully recovered in 1987. Because some related animals (e.g., crocodile and caimans) are similar and a concern, USFWS continues to regulate the harvest and trade of alligators

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(USFWS 2008). The American alligator will benefit from wetland and riparian habitat management (see **Section 7.6.4** and **Section 7.7**). The 45 CES/CEIE-C will respond to and relocate non-nuisance alligators, or contact the local trapper for nuisance alligators.

7.5.2.2 Atlantic Sturgeon

The federally endangered Atlantic sturgeon inhabits both salt and fresh water habitats. Some migrate into brackish and saltwater during the fall and feed in these areas throughout the winter months, and then migrate into fresh water rivers during the spring and remaining through the summer months, while others remain at sea for years. This species of sturgeon can be found from Canada to the St. Johns River in Florida (Atlantic Sturgeon Status Review Team [ASSRT] 2007), and can occur in the waters adjacent to CCAFS and PAFB.

Historically, the greatest threat to the Atlantic sturgeon was overharvesting. Currently, the main threat is the dams located on rivers of the Atlantic Seaboard, which prevent sturgeons from reaching historic spawning areas. Habitat destruction is also a threat to the sturgeon's population (e.g., dredging, pollution, excessive water withdrawal) (ASSRT 2007).

Management Guidelines: This species does not occur on the 45 SW installations; however, this species can occur in the waters adjacent to CCAFS and PAFB. Prior to implementing projects in the water or along the shorelines of the Banana River and Atlantic Ocean or in the water (e.g., dredging) that may affect the Atlantic sturgeon, the 45 CES/CEIE-C will consult with the USFWS to ensure no adverse effects would occur to this ESA-listed species. The federally endangered Atlantic sturgeon and smalltooth sawfish are protected by conducting in-water work IAW *Sea Turtle and Smalltooth Sawfish Construction Conditions* (see next **Section 7.5.2.3**).

7.5.2.3 Smalltooth Sawfish

The smalltooth sawfish (sawfish) population has decreased and is federally listed as endangered, primarily due to bycatch in commercial and recreational fisheries. Juvenile sawfish inhabit shallow coastal waters (bays, estuaries, river mouths, mud banks, and mangroves); adults in the same habitat but at deeper depths. The sawfish are slow to mature/grow, and produce low numbers of offspring. Recovery of the species includes minimizing human interaction and resulting injury/mortality, protect and restore sawfish habitat, and as sawfish abundance increases that sawfish will utilize areas where previously found. (NMFS 2009)

Management Guidelines: This species has not been documented on 45SW properties, and critical habitat has not been designated for the sawfish. If in-water work is proposed that could impact the species, a Section 7 consultation would be completed with NMFS, and the project would comply with NMFS *Sea Turtle and Smalltooth Sawfish Construction Conditions*[3], as well as any additional stipulations required as a result of the Section 7 consultation. The 45 SW currently protects and conserves mangroves along the CCAFS and PAFB shoreline of the

[3] The NMFS *Sea Turtle and Smalltooth Sawfish Construction Conditions*, revised March 23, 2006, website: http://sero.nmfs.noaa.gov/protected_resources/section_7/guidance_docs/documents/sea_turtle_and_smalltooth_sawfish_construction_conditions_3-23-06.pdf

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Banana River; this management action is beneficial to the species as this habitat provides a nursery environment for juvenile sawfish.

7.5.2.4 West Indian Manatee

The West Indian manatee (manatee) is federally listed as endangered, but is now under consideration by USFWS for reclassification to threatened (USFWS 2014f). Manatees are one of the few marine mammals known to inhabit the local salt-water lagoon system near CCAFS and PAFB. In Brevard County, the USFWS has designated all inland waters of the Banana River and all waterways between the Indian and Banana Rivers as critical manatee habitat. Since 1963, the northern Banana River, north of the NASA Causeway has had restricted boat access due to the manatee. An increasing number of manatees using the region (Provancha and Provancha 1988) prompted the USFWS to deny public power boats access to nearly all of the Banana River waters adjacent to CCAFS. The turning basin, west of CCAFS facility Hangar AF, typically has an area of exceptionally high concentration. Manatees may also be found in the Port Canaveral area, particularly in the Trident Basin. Manatees also utilize the waters of the PAFB marina and the Banana River waters adjacent to PAFB western boundary.

Management Guidelines: Due to the nature of the activities conducted at 45 SW properties and the proximity to the designated manatee critical habitat, the USAF will implement the following management measures at CCAFS and PAFB:

- Consult 45 CES/CEIE-C prior to projects within and in the vicinity of the USAF turning basin, waterways and adjacent shorelines of the Banana River as well as the Trident Wharf, Poseidon Wharf, and Air Force Wharf to determine if Section 7 consultation under the ESA will be required;
- Adhere to the FWC *Standard Manatee Conditions for In-Water Work* (FWC 2011) during all construction activities, including dredging, docks/pilings repair and replacement; and
- Ensure any natural resource enhancement projects or installation construction actions that may affect manatees is conducted IAW the guidelines established in the *Brevard County Manatee Protection Plan* (http://www.brevardcounty.us/docs/default-source/natural-resources-documents/brevard-county-manatee-protecton-plan.pdf?sfvrsn=0) developed under the Florida Manatee Sanctuary Act.

7.5.2.5 North Atlantic Right Whale

The North Atlantic right whale (right whale) is a federally endangered species and also federally protected as a depleted species by the Marine Mammal Protection Act (MMPA). Critical habitat for this whale occurs adjacent to CCAFS and PAFB for this species. The majority of the western North Atlantic population range from wintering and calving areas in coastal waters off the southeastern United States to summer feeding and nursery grounds in New England waters and north to the Bay of Fundy and Scotian Shelf (NOAA 2011). Historically, the biggest threat to the right whale survival has been hunting, but collisions with large ships and entanglement with fishing gear have caused significant injury and death to this species. Additional threats include habitat degradation from contaminants (NOAA 2005).

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Management Guidelines: This species does not occur on the 45 SW installations; however federally designated critical habitat occurs within Atlantic Ocean immediately adjacent to CCAFS and PAFB. Prior to implementing construction projects or beach restoration projects along the shoreline of these facilities that may affect the North Atlantic right whale, the 45 CES/CEIE-C will consult with NMFS to ensure no adverse effects would occur to this listed species.

7.5.2.6 Federally Protected Birds

The red knot, piping plover, roseate tern, wood stork and bald eagle are all bird species that are afforded federal protection. With the exception of the bald eagle (i.e., observed at MTA), these birds have only been observed at CCAFS and/or PAFB previously. None of these species are known to occur at JDMTA. No nesting behavior or nests have been observed on the 45 SW installations for these bird species.

Bald Eagle: Habitat includes areas close to coastal areas, bays, rivers, lakes, or other bodies of water. This bird usually nests in tall trees (mostly live pines in Florida) that provide clear views of surrounding area. Habitat loss due to development and commercial timber harvest as well as pollutants and decreasing food supply are a concern for this species (FWC 2001).

Piping plover: Found on open, sandy beaches and on tidal mudflats and sandflats during the winter on both Florida coasts, although it is more common on the Gulf coast. The primary threats to the piping plover include the destruction and degradation of summer and winter habitat, shoreline erosion, human disturbance, and predators (FNAI 2001).

Red Knot: This long distance migrant winters at the tip of South America in Tierra del Fuego and breeds on the mainland and islands above the Arctic Circle. During the spring and fall migrations, this shorebird habitually travels in nonstop segments of 1,500 miles or more along the Atlantic coast using the same stopover sites year and after year. The primary threats to this species include loss of its arctic breeding habitat and the continued availability of horseshoe crab eggs at its major Atlantic stopover sites (USFWS 2005).

Roseate Tern: This bird has only rarely been observed at CCAFS. The roseate tern nests in the Florida Keys, and is therefore likely to only occur on the 45 SW as a migrant. They forage for small, schooling fish in open water over sandbars, reefs, and tidal channels. The primary threats to this bird include human alteration to habitats and nest predation (FNAI 2001).

Wood Stork: This bird nests colonially in a variety of inundated forested wetlands, and can also be found nesting in artificial habitats (e.g., impoundments). Foraging primarily occurs in shallow water habitats. The wood stork is most susceptible to the manipulation of water regimes and loss of wetland habitat, which affect both nesting sites and feeding areas (FNAI 2001).

Management Guidelines: The 45 SW will implement the following management measures to protect these federally protected birds at CCAFS, PAFB and/or MTA:

- If bald eagle nests are found on the 45 SW installations, implement a 1,500-foot radius protection zone around active bald eagle nests;

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- If new land disturbing activities are proposed within 660 feet of a bald eagle nest, refer to FWC's (2008) *Bald Eagle Management Plan*;
- Maintain and enhance wetland and riparian habitat to benefit the wood stork; and
- Protect and restore shoreline habitat to benefit the red knot and piping plover.

7.5.3 General Management Strategies

The following general guidelines will be followed to facilitate the military mission and natural resources management objectives while minimizing negative impacts on rare species and their habitats:

- Consult with the 45 CES/CEIE-C prior to initiating projects with the potential to effect special status species;
- Ensure all projects and 45 SW operations are conducted IAW the current BOs (see **Appendix B**);
- Maintain a habitat mosaic using an ecosystem management approach that incorporates prescribed fire, habitat restoration, and invasive species control to support a diversity of rare species;
- Use prescribed fire to restore scrub habitat and other natural and rare communities dependent on a regular fire interval for indigenous and rare species;
- Use herbicides appropriately as part of IPM for invasive species control;
- Maintain corridors between wetlands, lakes, and other water bodies to provide for wildlife movement between areas;
- Update biological inventories as needed as the occurrence of T&E species is subject to change over time as a result of either recruitment, identification of additional protected species, or the change in status of species currently present at the 45 SW installations;
- Continue to coordinate and work with USFWS, NMFS and FWC on rare species management;
- Incorporate information on rare species protection and any related restrictions in environmental awareness documents and briefings to educate site users and prevent incidental take;
- If necessary, cordon off shore bird nesting areas to minimize disturbance to these nests by personnel utilizing the beach (i.e. security, fishermen, etc.) and install signs warning personnel that no admittance is allowed due to the presence of federal and state protected nesting birds;
- Identify areas on the beach where least terns, black skimmers or other birds are nesting prior to sea turtle nesting season, so that these areas can be avoided as much as possible to prevent any direct impacts to nesting birds, eggs or chicks while during required sea turtle surveys; and
- Follow FWC (2010) Osprey Nest Removal Guidelines when replacing active and inactive nests, and continue to utilize artificial platforms designed for osprey nesting to encourage the nesting birds to nest on the platform instead of other man-made mission essential structures.

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7.6 Water Resource Protection

Primary Regulatory Drivers

- CWA
- AFI 32-7041
- EO 11988
- Florida Water Resources Act of 1972 (Chap 373 of F.S.)
- Section 403.088 and 403.0885 of F.S. (NPDES Program)
- FAC 62-621.300

Due the abundance of water resources within and surrounding the majority of the 45 SW facilities, the protection of surface water and groundwater is considered a high priority for the USAF. CCAFS and PAFB are both situated on barrier islands that are bound to west by the Banana River and to the east by the Atlantic Ocean, while MTA is situated approximately 7 miles inland from the Indian River and 10 miles from the Atlantic Ocean. The MTA is bounded by the Melbourne-Tillman Canal to the south, which is a tributary of the St. Johns River (C-1 Canal was redirected to flow into the St. Johns River). Three drainage canals within MTA empty into this Melbourne-Tillman Canal. Unlike the other 45 SW installations, no surface waters, canals or wetlands are located on JDMTA. For a complete summary of water resources on the 45 SW installations, see **Section 4.4**.

This Section will primarily focus on the management of soil erosion, stormwater, and surface water and groundwater quality. Wetland protection is addressed in **Section 7.7**, while coastal zone and marine resources management are discussed in detail in **Section 7.14**.

As described in **Section 4.1.3**, climate change is likely to increase the variability of precipitation and increase water temperature in Florida. Changes that have already been observed in Florida include retreating and eroding shorelines, dying coral reefs, salt water intrusion into the freshwater aquifer, increasing numbers of forest fires, and warmer air and sea surface temperatures (NRDC 2001). Depending on how things change water resources could be significantly impacted, particularly on and in the vicinity of PAFB and CCAFS, with some water resources expanding and others reducing in size.

7.6.1 Regulatory Requirements

7.6.1.1 Surface Waters

USACE regulates the discharge of dredged or fill material into “waters of the US”, including wetlands, under Section 404 of the CWA. Even an inadvertent encroachment into waters of the US resulting in a displacement or movement of soil or fill material has the potential to be viewed as a violation of the CWA if an appropriate permit has not been issued by the USACE. Waters of the US are defined under 33 CFR Part 328.3(a) and referred to as jurisdictional waters. Jurisdictional waters may include coastal and inland waters, lakes, rivers, ponds, streams, intermittent streams, vernal pools, wetlands, and other waters, that if degraded or destroyed could affect interstate commerce. For more on wetlands and coastal resources, see **Section 7.7** and **Section 7.14**, respectively.

According to USEPA regulations issued under Section 404(b)(1) of the CWA, permitting of fill activities will not be approved unless the following conditions are met: no practicable, less environmentally damaging alternative to the action exists; the activity does not cause or contribute to violations of state water quality standards (or compliance under Section 401 of the

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CWA); the activity does not jeopardize listed species or sensitive cultural resources (33 CFR Part 320.3 [e] and [g]); the activity does not contribute to significant degradation of waters of the US; and all practicable and appropriate steps have been taken to minimize potential adverse impacts to the aquatic ecosystem (40 CFR Part 230.10).

Section 401 of the CWA gives the State of Florida the authority to regulate, through the state Water Quality Certification (WQC) program, proposed federally-permitted activities that may result in a discharge to water bodies, including wetlands. The state may issue certification, with or without conditions, or deny certification for activities that may result in a discharge to water bodies. In Florida, the FDEP is responsible for issuing Section 401 WQC.

The Florida Water Resources Act (FWRA; Chapter 373 of F.S.) mandates the state agency to implement the State's surface water regulatory program, which covers virtually any movement of soil surface or construction anywhere in the peninsula of Florida, from coast-to-coast, including uplands and wetlands. Under Part IV of this statute, Florida implements the Environmental Resource Permit (ERP) program, which is implemented jointly by the FDEP and the five water management districts. The state ERP program operates in addition to the Federal program that regulates activities in waters of the US.

CCAFS, PAFB and MTA are located in the SJRWMD, which encompasses Brevard County and 17 additional counties in north-central Florida. JDMTA is located in the SFWMD, which includes Martin County along with 15 additional counties in south Florida. The Water Management Districts are responsible for managing the ground and surface water supplies of the region. Duties of these Districts include permit issuance, land acquisition, water quality and quantity research, ground and surface water mapping, and outreach and public education. Each of the five districts maintains a separate operating agreement with FDEP that outlines which agency will process ERPs for particular projects. The Florida ERP combines the former dredge and fill permit issued by FDEP (i.e., Section 401 CWA) and the management and storage of surface waters permit issued by the Water Management Districts.

The Section 303(d) list includes Florida water bodies that are not attaining one or more designated uses and require the establishment of TMDLs to meet and maintain Water Quality Standards. Both the Indian River (above the 520 Causeway) as well as the Banana River (above and below the 520 Causeway), located in close proximity to CCAFS, PAFB, and MTA are listed as impaired waters (USEPA 2010). In 2009 the FDEP established a TMDL for the Indian River and Banana River Lagoon (BRL) to reduce pollutant loading of total nitrogen and total phosphorus (FDEP 2010). 45 SW properties are set to reduce discharges over a 15-year period which includes compliance pollutant load screening, street sweeping (removal of sediments), and structural best management practices.

7.6.1.2 Floodplains

FEMA-designated floodplains are protected under EO 11988 – *Floodplain Management*. The purpose of EO 11988 to reduce the risk of flood loss, minimize the impacts of flooding, and restore and preserve the natural and beneficial values of floodplains when acquiring, managing, or disposing of Federal lands. The Water Management Districts administer flood protection programs. Projects proposed in floodplains in Florida are reviewed in conjunction with NEPA,

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ERP, and Coastal Zone Management Act (CZMA) reviews. No additional forms or permit applications are required for floodplain reviews. FEMA designated 100-year floodplains occur within all four of the 45 SW installations. For more information on 45 SW floodplains, see **Section 4.4.4**.

7.6.1.3 Stormwater

FDEP implements the national pollutant discharge elimination system (NPDES) permitting program in the State of Florida, and administers this program IAW Section 403.0885, F.S. The NPDES stormwater program regulates point source discharges of stormwater into surface waters of the State of Florida from certain municipal, industrial and construction activities. As the NPDES stormwater permitting authority, DEP is responsible for promulgating rules and issuing permits, managing and reviewing permit applications, and performing compliance and enforcement activities. The sources of stormwater discharges regulated under the NPDES program fall into three categories: construction, industrial, and municipal separate storm sewer systems (MS4).

The 45 SW also maintains a NPDES MSGP, along with multiple ERP permits from SJRWMD, for both CCAFS and PAFB. The MSGP addresses potential stormwater pollution associated with the industrial operations on CCAFS. As a part of the MSGP, the 45 SW developed SWPPPs for CCAFS (VZ Technologies 2014a) and PAFB (SpecPro 2010). These plans were originally created in 1996 and are updated every five years. The objective of the plans is to provide the 45 SW with a practical guide to preventing stormwater pollution. Successful implementation of these plans will fulfill regulatory requirements, promote environmental awareness, and improve the overall quality of stormwater discharges and, therefore, reduce impacts to natural resources.

Non-point source pollution at CCAFS consists primarily of stormwater run-off from impervious surfaces associated with industrial and administrative activities

CCAFS and PAFB installations discharge stormwater runoff to the BRL under NPDES Permits. Enforcement of pollutant reduction goals will be through the NPDES Municipal (separate) Stormwater Sewer System (MS4) permits.

7.6.2 Permitting

As discussed above, USACE, FDEP, SJRMWD and SFWMD have jurisdiction over 45 SW water resources. The USACE administers and issues Nationwide Permits (NWPs), and Letters of Permission that cover routine or minor projects, as well as Individual and General Permits. The state (FDEP, SJRWMD, and SFWMD) issues State Programmatic General Permits (SPGP) that covers many routine or minor projects. The USACE issues Individual Permits for larger projects, or those that do not meet the requirements of a NWP or SPGP. The USACE and Florida have adopted joint ERP and wetland resource application. Under the Operating Agreement between USACE, FDEP, SJRMWD and SFWMD, all applications should be submitted to FDEP or Water Management District, as applicable. If the project does not qualify for a SPGP, the application will be forwarded to USACE by FDEP or Water Management District. The ERP Program regulates activities involving the alteration of surface water flows.

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This includes new activities in uplands that generate stormwater runoff from upland construction, as well as dredging and filling in wetlands and other surface waters. Water resource permits are also issued by USACE under Section 10 of the Rivers & Harbors Act of 1899, and includes in-water work.

Permitting requirements vary depending on type, location, and extent of disturbance. Prior to initiating projects or activities (e.g., dredging, filling, work in and around a stream or wetland) occurring within or with the potential to affect a floodplain, wetland, or other water body, the appropriate agencies (USACE, FDEP or SJRWMD) should be consulted to determine permitting requirements.

NPDES permits for construction and industrial activities are not integrated into the ERP permit, and are issued separately. Construction or other land-disturbing activity that results in soil disturbance (e.g., clearing, grading or excavating) of 1-acre or more must be permitted by FDEP under the NPDES permit program. Operators of industrial facilities that meet the criteria for coverage under the program must obtain a generic or individual NPDES permit and implement a SWPPP.

Furthermore, as a result of recent USEPA ruling, FDEP has issued a new permit through its NPDES Program under the provisions of Section 403.088 and 403.0885, F.S. The new NPDES Florida Pesticide Generic Permit pertains to pesticide applications on waters of the state and land areas adjacent to waters of the state, and is consistent with the USEPA pesticide general permit requirements published under 40 CFR 122. This NPDES general permit is applicable to all persons who discharge pesticides to waters of the state from the application of biological pesticides or chemical pesticides, which leave a residue of the pesticide or its degradation products. The following categories of pesticide discharges are covered under this general permit: (1) mosquitoes and other flying insect pest management, (2) aquatic weed and algae control, (3) aquatic nuisance animal control, and (4) forest canopy pest control. Waters that are designated as Outstanding National Resource Waters (ONRWs) or on the CWA 303(d) list do not qualify for this permit. As discussed in **Section 4.4.3**, the Indian River (above the 520 Causeway) as well as the Banana River (above and below the 520 Causeway), located in close proximity to CCAFS, PAFB, and MTA are on the 303(d) list as impaired waters (USEPA 2010).

The submission of a Notice of Intent (NOI) and development of a Pesticide Discharge Management Plan under this general permit are required for certain operators in Florida pursuant to sub Section 62-621.300(8)(b), FAC. The DoD is exempt from the requirement to submit an NOI. Operators required to complete an NOI include mosquito control programs and districts, Water Management Districts, USACE, USFWS, FWC, FDACS, USDA, USFS, and US National Park Service (NPS). A complete list of operators and other permit provisions are provided in 62-621.300, FAC.

7.6.3 Soil Conservation and Erosion Management

Improper erosion control can lead to CWA violations, thus potentially resulting in fines and other penalties, which may ultimately compromise the integrity of the 45 SW installations. Regardless of regulatory compliance, appropriate soil conservation and erosion control are vital to the mission. Unmanaged and extensive soil erosion can threaten the mission and require diversion

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of funds from other priorities. Delays in managing the erosion can increase the cost to repair by several orders of magnitude. Some examples of the potential effects of poor soil and erosion management include:

- Undermining of roads;
- Loss of topsoil and vegetation, which further accelerates erosion;
- Impacts to streams or other aquatic habitats, potentially resulting in water quality impairment; and
- Creation of unusable areas due to erosion.

Two main types of soil erosion exist: wind erosion and water erosion. Soils on the 45 SW installations are generally sandy with a high susceptibility for wind erosion with the exception of a few soil types at MTA. However, soil erosion is not notable due the porous, sandy soils, extent of vegetative cover, flat terrain of the installations, and prohibited use of off-road vehicles except for ATVs by 45 SW environmental and safety personnel (see **Section 7.1.4**). Minor erosion periodically occurs along slopes of roadways, stormwater retention ponds, and drainage canals. However, grounds maintenance practices such as adding top soil, seeding and sodding over-eroded or bare areas reduce the potential of significant or chronic soil erosion on the installation (see **Section 7.8**). During soil disturbing activities, BMPs are followed to minimize erosion. For a complete summary of soils on the 45 SW installations, see **Section 4.3**.

7.6.4 Riparian Buffers

Sandy soils are also more likely to allow pollutants to leach into groundwater and water resources, so maintenance of vegetation buffers is essential to minimize this risk. The 45 SW will maintain riparian buffers around water resource to reduce the influx of sedimentation and other materials into the water resources in compliance with the CWA and FWRA. Riparian buffers are sometimes also referred to as riparian management zones, vegetation buffers, buffer strips, filter strips or stream management zones (SMZ).

One of the primary purposes of a riparian buffer is for water quality protection by providing vegetation to interrupt water flow and to trap and filter out suspended sediments, nutrients, chemicals, and other polluting agents before they reach the body of water. Riparian buffers should be maintained along all perennial and intermittent streams, lakes or ponds where nearby management activities result in surface/soil disturbance, earth changes and where erosion and sediment transport occur during rain events. Maintaining the forest cover around the small water resources within the forest is important for preventing sedimentation and impacts to water quality.

Buffers can take many forms and may vary depending on the upland land use and the type of water resource being protected. Vegetation buffers can either be grassland or forest and may or may not be mowed and maintained occasionally. The *Silviculture BMPs Manual* (FDACS 2011) provides BMPs for protecting natural water resources from degradation and sedimentation that can sometimes occur because of erosion during and immediately after conducting activities in forested areas. One of the key BMPs is the establishment of SMZs, which provide a protected

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vegetative buffer. A copy of the FDACS manual can be found at: http://www.floridaforestservice.com/forest_management/bmp/index.html. For information on coastal resources and beach erosion, see **Section 7.14**.

7.6.5 Stormwater Management

Stormwater runoff is produced when rainfall during a storm exceeds the infiltration capacity of the soil or encounters an impervious surface. Stormwater runoff can be a significant source of pollutants as well as sediments to surface waters, especially in areas with impervious surface cover or where groundcover has been disturbed. Sources of stormwater runoff and pollution could originate from operational, maintenance, and/or administrative areas within 45 SW properties. Additionally, stormwater runoff from impervious surfaces has a high potential to carry pollutants into wetlands, surface waters, and groundwater.

Stormwater runoff from industrial facilities, parking lots, and roadways is the primary cause of non-point source pollution at the 45 SW. Run-off contaminated with petroleum products (oils and grease) from asphalt surfaces and other hazardous materials/wastes from outdoor storage yards/work areas can discharge to surface waters during an intense rainfall. The potential for non-point source stormwater pollution at the 45 SW is minimized by storage of run-off in retention ponds and swales, and BMPs to reduce exposure of potential contaminants to stormwater. Construction of new facilities and impervious surfaces include surface water management systems that collect run-off into a system of swales or retention basins. These stormwater facilities filter out and break down contaminants from water passing through vegetation and soils and percolate run-off into the surficial aquifer.

Many of the existing facilities on CCAFS and PAFB were constructed before the advent of stormwater regulations or stormwater treatment criteria. Most facilities and impervious areas constructed since 1985 included a stormwater collection system. Older facilities and impervious areas on the installation generally have stormwater drainage facilities that are designed more for conveyance and off-site discharge of stormwater as opposed to on-site collection/disposal. Most of these conveyance systems are grassed swales that provide some level of treatment and percolation prior to discharge. However, there are numerous developed areas that discharge run-off to receiving surface waters with minimal or no treatment.

CCAFS has a NPDES Multi-Sector General Permit (MSGP) for Discharge Associated with Industrial Activity. The Facility identification (ID) under this permit for CCAFS is FLR05A947-003 and the permit expires 10 Apr 2016. This permit covers multiple facilities on CCAFS. PAFB has a NPDES Generic Permit for Discharge of Stormwater from Phase II MS4, which expires in 2018. The permit facility ID for PAFB is FLR04E074. In support of these permits, the 45 SW maintains SWPPPs for these installations (VZ Technologies 2014a, and SpecPro 2010). The SWPPP describes the programs, BMPs, monitoring and other measures. MTA and JDMTA do not have NPDES industrial permits.

The 45 SW obtains a NPDES Construction General Permit from the FDEP when construction and other land disturbing activities result in 1 acre or more of soil disturbance (e.g., clearing, grading or excavating). Individual construction sites and areas impacted by operational activities can also be regulated under Florida's ERP program codified in F.S. Chapter 373. ERPs typically

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require stormwater control structure installation and perpetual site inspection and maintenance requirements.

Accidental releases of petroleum products or hazardous materials/wastes (spills) can directly affect surface waters and surrounding watershed. The 45 SW Management Plan 19-14, Petroleum Products and Hazardous Waste Management Plan, outlines specific measures for proper collection, management and disposal of petroleum products/waste and hazardous/non-hazardous wastes. Adherence to Management Plan 19-14 significantly reduces the chance of pollutant releases to the environment. However, in the event of a spill, 45 SW Plan 10-2, Vol. 2, 45 SW Hazardous Material Response Plan provides for appropriate reporting and emergency response to mitigate environmental and human health impacts. Further, the CCAFS Spill Prevention Control Countermeasures (SPCC) Plan provides guidance to minimize, contain, and remediate spills.

The USEPA and FDEP are good sources for stormwater BMPs. The FDEP's *Florida Stormwater Erosion and Sedimentation Control Inspector's Manual* (FDEP 2008), and the USEPA's *Developing your Storm Water Pollution Prevention Plan: A Guide for Construction Sites* (USEPA 2007) are both useful references. FDEP also offers a suite of additional resources for specific activities related to nonpoint-source management at http://www.dep.state.fl.us/ water/nonpoint/pubs.htm.

7.6.6 Integration with Other Plans

The SJRWMD has developed a comprehensive conservation and management plan for the Indian River Lagoon National Estuary Program (IRLNEP). The goal of the IRLNEP is to attain and maintain the water and sediment quality needed to support a macrophyte-based (seagrass) system, endangered and threatened species, fisheries, and recreation in the lagoon. To the maximum extent possible, the 45 SW participates in management activities that support the goal of the IRLNEP. Many of the management activities related to T&E species management and water quality protection detailed in this plan support the goals and objectives of the IRL program.

The PAFB boat marina participates in FDEP's Clean Marina Program. FDEP developed guidance that describes the requirements to qualify as a Clean Boatyard under the FDEP Clean Marina program. The marina manager, in coordination with 45 CES/CEIE-C, ensures that all marina users comply with the BMPs detailed in the *Clean Marina Program Clean Boat Requirements for PAFB Marina* (see **Appendix I**) are followed to minimize impacts to PAFB's water resources.

7.6.7 Management Strategies for Water Quality

In general, water resources are managed through conservation and impact avoidance. Although water quality monitoring is not always required, it is a good way to measure ecosystem health. Land-based environmental degradation eventually affects water quality and aquatic ecosystems. The following strategies are implemented to ensure compliance with regulations and to protect and enhance the 45 SW water resources.

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- Consult with the 45 CES/CEIE-C prior to initiating projects with the potential to disturb water resources or their buffers;
- Restrict vehicles from within 50 feet of water resources except where established crossings and roads exist.
- Adhere to all signage posted on the installation to further protect environmentally sensitive areas;
- Maintain vegetated buffers around water resources;
- Apply for an appropriate permit when regulated waters, including associated buffers, will be impacted;
- Plan development to avoid impacts to water resources to the maximum extent possible and mitigate unavoidable impacts;
- Review operations and maintenance programs that potentially affect water resources, and develop procedures and guidelines to avoid the loss of function;
- Adhere to BMPs during construction and operational activities as described in applicable manuals, plans and permits;
- Minimize the amount of impervious surfaces in newly developed areas;
- Minimize the use of pesticides and herbicides, and adhere to the NPDES Florida Pesticide Generic Permit (see **Section 7.6.2**).
- Revegetate barren ground;
- Maintain aerators within PAFB canals that were installed to improve water quality and provide better habitat for aquatic fish and wildlife;
- Continue to monitor water quality along the Atlantic Ocean beaches and the Banana River to ensure they are safe for recreational use IAW USAF Occupational Health and Safety Regulation 48-14; and
- Ensure the SWPPP, SPCC Plan and other relevant 45 SW environmental plans are implemented.

7.7 Wetland Protection

Canals on the west side of CCAFS that directly connect to the Banana River were identified by USACE as jurisdictional wetlands. However, this wetland determination is not an official delineation as CCAFS projects that may affect waters of the U.S. are reviewed by USACE on a case-by-case basis. Based on NWI mapping, a number of potential wetland habitats occur on CCAFS including mangrove wetlands, salt marsh, and freshwater wetlands as well as manmade wetland habitats created by impoundments and borrow pits.

A jurisdictional wetland determination (JD) within PAFB was conducted by USACE in 2006. USACE provided this wetland delineation to USAF, but the JD expired (2011). However, the USACE still identifies the canals that directly connect with the Banana River as jurisdictional. Other isolated wetlands exist on PAFB, but are assessed by 45 CES/CEIE-C and regulators based on potential project site boundaries and permitting requirements due to variable

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hydrography. NWI wetlands mapped for PAFB are not considered regulatory and are used for planning purposes only to assist with identification of potential jurisdictional waters and mitigation. The golf course canals within PAFB were modified and included in a stormwater Regional Environmental Resource Permit; these canals are not jurisdictional wetlands.

No NWI wetlands and no jurisdictional wetlands have been mapped on MTA. However, Schultz and Knight (1997) identified general wet area boundaries (including canals, ditches, and swales with wetland plant species) at MTA in 1996. Unlike the other 45 SW installations, no wetlands (NWI and jurisdictional), canals, and surface water bodies are located within JDMTA.

For a summary of wetlands within the 45 SW installations, see **Section 5.5**.

Wetlands are some of the most productive habitats in the world, and often provide migration corridors for a variety of species. The health of the wetlands at the 45 SW continues to be important to the T&E populations, as well as for the maintenance of surface hydrology, wildlife populations, and aesthetics. Although installation-wide wetland delineations are not typically conducted at the 45 SW installations, wetland inventories have been completed at these installations over the years, typically on a project-by-project basis. Furthermore, the 45 CES/CEIE-C periodically conducts site assessments of the 45 SW wetlands to monitor wetland health and minimize potential negative impacts.

7.7.1 Regulatory Requirements

As described in **Section 7.6.1**, USACE regulates the discharge of dredged or fill material into "waters of the US", including wetlands, under Section 404 of the CWA. Under CWA, for an area to be classified as a wetland, three conditions must be present: (1) wetland hydrology; (2) hydric soil; and (3) hydrophytic vegetation. Areas that may be periodically wet, but that do not meet the requisite criteria, are not classified as "delineated" wetlands. Once a wetland delineation is completed, then a jurisdictional determination can be made. A jurisdictional determination is made based on multiple criteria, but the relationship of the wetland to other waters of the US is important.

The FWRA (Chapter 373 of F.S.) mandates the state agency to implement the State's surface water regulatory program, which covers virtually any movement of soil surface or construction anywhere in the peninsula of Florida, from coast-to-coast, including uplands and wetlands. Under Part IV of this statute, Florida implements the Environmental Resource Permit (ERP) program, which is implemented jointly by the FDEP and the five water management districts. The ERP program operates in addition to the Federal program that regulates activities in waters of the US pursuant to the environmental provisions of F.S. 373.414, the State has jurisdiction over those areas that are delineated as wetlands, including all isolated wetlands, under the State methodology.

Management of wetlands on Federal lands and military installations is further indicated by EO 11990 and DoDI 4715.03, respectively. Under those instructions, wetlands are required to be managed for "no net loss" on Federal lands, including military installations. In support of these policies, long- and short-term adverse impacts associated with the destruction or modification of

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wetlands and support of new construction in wetlands should be avoided to the maximum extent possible.

7.7.2 Permitting

For general water resources permitting, see **Section 7.6.2** above. As discussed above, the USACE and FDEP have regulatory authority over waters of the US and state under Sections 404 and 401 of the CWA.

USACE administers and issues Nationwide Permits (NWPs), and Letters of Permission that cover routine or minor projects, and also issues Individual and General Permits. The state (FDEP, SJRWMD, and SFWMD) issues SPGPs that cover many routine or minor projects. The USACE issues Individual Permits for larger projects, or those that do not meet the requirements of a NWP or SPGP. The USACE and Florida have adopted joint ERP and wetland resource applications. The ERP Program regulates activities involving the alteration of surface water flows. This includes new activities in uplands that generate stormwater runoff from upland construction, as well as dredging and filling in wetlands and other surface waters. Permitting requirements vary depending on type, location, and extent of disturbance. Water resource permits are also issued by USACE under Section 10 of the Rivers & Harbors Act of 1899, and includes in-water work. Florida also implements a separate permitting program for trimming or altering mangroves under Section 403.9321 through 403.9333, F.S., although mangrove trimming and alteration can be incorporated into an ERP permit. Prior to initiating projects or activities (e.g., dredging, filling, work in and around a stream or wetland) occurring within or with the potential to affect a floodplain, wetland, or other water body, the appropriate agencies (USACE, FDEP or SJRWMD) should be consulted to determine permitting requirements.

7.7.3 Management Strategies for Wetlands

In general, wetlands will be managed through conservation and impact avoidance. The following guidelines will be implemented to ensure compliance and to protect and enhance the 45 SW wetlands.

- Consult with the 45 CES/CEIE-C prior to initiating projects with the potential to disturb wetlands or their buffers;
- Restrict vehicles within 50 feet of water resources except where established crossings and roads exist;
- Adhere to all signage posted on the installation to further protect environmentally sensitive areas;
- Maintain vegetated buffers around water resources;
- Avoid disturbance of wetlands and aquatic habitats where practicable;
- Apply for an appropriate permit when regulated waters, including wetlands and associated buffers, will be impacted;
- Plan development to avoid impacts to wetlands to the maximum extent possible and mitigate unavoidable impacts;

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- Identify 45 SW wetland restoration projects (through permitting) where mitigation banking credits may be obtained. Possibly establish a Regional Offsite Mitigation Area (ROMA) if multiple projects meet the thresholds and the regulatory agencies agree to the ROMA criteria;
- Manage invasive species to promote desirable native species; and
- Ensure the management strategies identified in **Section 7.6** are implemented.

7.8 Grounds Maintenance

Primary Regulatory Drivers

- SAIA
- AFI 32-7064
- EO 12902
- EO 11987

The general goal for grounds maintenance is to enhance mission capability by improving the quality of life for the people who live and work at the 45 SW. Grounds maintenance on CCAFS and PAFB are performed under specific contracts with professional grounds maintenance contractors. Landscaping and grounds maintenance are limited given the types of activities on and overall size of MTA and JDMTA. The *45 SW Landscaping and Grounds Management Plan* (see **Appendix H**) categorizing 45 SW grounds into three categories (improved, semi-improved and unimproved), which distinguish the level of grounds maintenance and landscaping design activities required by area. This Plan outlines management actions for each category, and how it relates to other natural resources management areas. Furthermore, the Plan includes the PAFB Golf Course Environmental Management Plan for golf course management, specifications for tree pruning, planting sod and planting trees/shrubs, and a list of 45 SW native/salt tolerant plants. No site-specific plans or management measures have been developed for MTA or JDMTA.

Xeriscaping principles are incorporated into landscaping and grounds maintenance activities, which recognizes the importance of conserving water and planting native flora that thrive in specific conditions. When installing new landscaping, native vegetation will be planted whenever feasible. As mentioned above the *45 SW Landscaping and Grounds Management Plan*, contains a list of native plants for the 45 SW installations. In addition, native plants suitable for planting in Florida are available at http://www.fnps.org/plants and additional guidance is available in *The Florida Yards & Neighborhoods Handbook* (IFAS Extension 2009) at http://floridayards.org/landscape/2009_FYN_Handbook_non-508_web_vSept09.pdf.

An Urban Forestry Management Plan was developed for CCAFS and PAFB in 1997 that identified the health maintenance, and risk potential of each tree. Follow up on tree health should occur to track any diseases or the need to replant where trees have been removed. The 45 CES/CEIE-C will assess future plantings of trees and native species for habitat restoration and urban forest enhancement

All landscaping and ground maintenance activities must follow the 45 SW IPMP (see **Appendix L**). An Invasive Species Control Plan has also been developed, which includes CCAFS, JDMTA, MTA, and PAFB, and is included in **Appendix G**, which identifies specific management and control measures for invasive plant species known to occur on the 45 SW

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installations. Additionally, xeriscaping principles are incorporated into landscaping and grounds maintenance activities, which recognizes the importance of conserving water and planting native flora that thrive in specific conditions.

The President released a memorandum (http://www.whitehouse.gov/the-press-office/2014/06/20/presidential-memorandum-creating-federal-strategy-promote-health-honey-b) addressing federal efforts to enhance the health of pollinators, including honey bees, native bees, birds, bats, and butterflies (79 FR 35901). The memorandum establishes a Pollinator Health Task Force, co-chaired by the USDA and EPA, and includes DoD and other agency heads. The task force will develop a National Pollinator Health Strategy, with explicit goals and a Pollinator Research Action Plan. Task force member agencies will develop plans to enhance pollinator habitat, and subsequently implement, as appropriate, such plans on managed lands and facilities. Task force member agencies will incorporate pollinator health as a component of all future restoration and reclamation projects. Consistent with law and the availability of appropriations, DoD will support habitat restoration projects for pollinators and direct military service installations to use, when possible, pollinator-friendly native landscaping and minimize use of pesticides harmful to pollinators through integrated vegetation and pest management practices. Future landscaping projects at all federal facilities will, to the maximum extent appropriate, use plants beneficial to pollinators.

Recommended landscaping practices should benefit the environment and generate long-term cost and maintenance time savings. The use of native plants not only protects biodiversity and provides wildlife habitat, but it can also reduce demands for fertilizer, pesticides, and irrigation and their associated costs. General recommendations to promote environmentally beneficial landscaping include:

- Ensure 45 CES/CEIE-C reviews landscape plans for compliance with the 45 SW Landscaping and Grounds Management Plan (see **Appendix H**) and the below recommendations;
- When practical, preserve existing trees and shrubs provided the vegetation is healthy and the root systems are not significantly impacted by construction;
- Design landscaping to be suitable to the specific site and appropriate for the use and operation of the facility;
- Implement water-efficient practices, use efficient irrigation systems and recycled water, and use landscaping to conserve energy;
- Limit turf areas where practical to reduce water use and maintenance requirements;
- Use wood mulch instead of rock mulch when practical;
- Prevent expansion of nonnative plants into native plant areas by using regionally native plants for landscaping where practicable;
- Reuse landscape trimmings on site as appropriate;
- Do not use seed-bearing or fruiting plants that provide food for wildlife and wildlife habitat in areas near airfields;

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- Plant shelterbelts of trees around the borders of parking lots and near buildings to decrease energy use by the facilities and lessen heat island effects of large parking lots; and
- Follow the nine Florida-Friendly Landscaping Principles (http://fyn.ifas.ufl.edu/): (1) Right Plant, Right Place, (2) Water Efficiently, (3) Fertilize Appropriately, (4) Mulch, (5) Attract Wildlife, (6) Manage Yard Pests Responsibly, (7) Recycle, (8) Reduce Storm Water Runoff, and (9) Protect the Waterfront.

7.9 Forest Management

Primary Regulatory Drivers

- SAIA
- AFI 32-7064
- ESA
- MBTA
- Florida Endangered and Threatened Species Act (Chapter 379.2291, F.S.)

Vegetation not covered in **Section 7.8** is covered in this section of the INRMP. Vegetation management includes forest management, fish and wildlife habitat management, rare species habitat management and some invasive plant species management. There is a significant overlap in the objectives, activities and projects within this section and all other sections within the INRMP, which is indicative of the essential role vegetation plays in ecosystems and natural resources management. The vegetation on the 45 SW installations is a mixture of beach dunes, coastal grasslands/strands, scrub, hammocks, flatwoods, and wetlands (e.g., mangroves, emergent), along with maintained grassland and landscaped areas. For more details on vegetation on CCAFS, PAFB, MTA and JDMTA, refer to **Section 5.2** and **Appendix D**.

A key element of historic vegetation management within Florida is wildland fire. Many of the habitats (i.e., scrub and flatwoods) are fire-adapted landscapes and benefit from wildland fire, both wildfires and prescribed fires, to reduce woody encroachment and reset forest succession. While historic vegetation communities are still present on the 45 SW installations, the extent and distribution of these natural communities has been impacted by historic human settlement and development activities and fire suppression. Fire suppression has led to a build-up of vegetative fuel loads and adverse eaffects to the health of the vegetation communities and their habitat quality. See **Section 7.10** and **Appendix J** for more on wildland fire management.

Four basic natural community types occur on the 45 SW installations:

- forested;
- scrub;
- coastal dune, grassland, and strand; and
- wetlands.

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Different management is required for each of these vegetation types. See **Sections 7.6** and **7.7** for more information on riparian and wetland habitat management. Management for the remaining three basic vegetation types is provided below.

7.9.1 Forested Community Management

No forested habitat occurs on PAFB and JDMTA. Thus, only CCAFS and MTA have been examined for potential commercial forestry operations.

Previously, approximately 9,500 acres of land on CCAFS were examined for their ability to produce forested products for commercial use. These areas were comprised of oak scrub, maritime hammock, or hydric hammocks. The oak trees, which dominate these forests, are not large enough, both in height and basal diameter, to be profitably logged for saw timber. The larger oaks and pine trees on the installation, which typically would be used for saw timber, are located in the hydric hammocks that parallel the Banana River shoreline where numerous archaeological sites are located. The amount of salable timber in these areas is relatively sparse. Further, the potential environmental impacts resulting from logging operations in these hammock communities would far exceed any benefits that may be derived from conducting a commercial timber sale. Similarly, clear cutting native vegetation and implementing a silviculture program specifically for the development of a commercial forest would significantly impact a number of threatened, endangered and/or protected animal species as well as cultural resources. Prior migratory bird surveys (Fleming and Greenwade. 2007; SpecPro 2007) identified the importance of maintaining maritime hammock for migrating and resident birds.

In a further effort to utilize this resource, logging for firewood was added to a land-clearing contract conducted for scrub habitat rehabilitation through the Defense Reutilization and Marketing Office (DRMO). When considering the additional funds required to task the land clearing contractor to cut, palletize and deliver (to DRMO) the firewood, as opposed to the cost to simply clear and grub a site, it was determined that a commercial firewood harvesting program was not cost effective. For these same basic reasons, economics, cost to benefit ratio, environmental impacts, and product marketability, no other types of forest product harvesting are planned for CCAFS.

Similarly, the MTA was assessed by FFS in 1988 to determine if timber harvest was economical. Pine flatwoods are the only forest type found on MTA. Due to historic land clearing prior to USAF ownership as well as alterations associated with the construction of facilities, flatwoods at MTA are not high quality. Based on the FFS assessment, it was determined that it would take approximately 10 years of active management to provide an adequate stock of trees. Natural regeneration of pine was not considered a viable method because the existing pines were not genetically high quality and mechanical planting would allow an even spacing of trees. As part of this effort, annual prescribed burning would be necessary. As a result, it was decided that the cost of maintaining a pine plantation with contracting services for site preparation, maintenance, controlled burn support, planting, harvesting, and commercial sale would provide limited profit.

As such, active forest management activities on CCAFS and MTA are focused on mechanical vegetation clearance or prescribed burns for the purpose of maintaining the quality of forest

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communities for wildlife and reducing the risk of catastrophic wildfire by managing compartments with high fuel loads. Recommendations for managing forest as wildlife habitat, while supporting the mission and specific use of the forest include:

- Protect intact, large blocks of forest;
- Implement *Silviculture BMPs Manual* (FDACS 2011) during activities within 45 SW forests (e.g., mechanical clearing);
- Obtain the necessary permits through FDEP when trimming or altering mangroves (only applicable to CCAFS) (see **Section 7.7.2**);
- Manage invasive species (e.g., Brazilian pepper) to promote desirable native species;
- Allow openings within the forest to form naturally (e.g., storm blow down) and then natural succession to occur; and
- Maintain mature trees, including snags, unless they pose a safety hazard or are creating excessive perches for predatory birds that could impact population dynamics of listed bird species (only applicable to CCAFS).

7.9.2 Scrub Community Management

The dominant vegetative community within CCAFS and JDMTA is scrub, which can be further classified into coastal oak, oak, or rosemary scrub. Historically, stands with a short fire return interval maintained an evergreen oak canopy and saw palmetto understory while stands that had a less frequent fire return interval maintained a sand pine overstory. Well-drained sites generally have more of the shrubby evergreen oak component while moister sites tend to be dominated by saw palmetto. Coastal scrub stands are important as they serve as habitat for a variety of rare and endangered species including the Florida scrub jay, SEBM, Indigo snake and the gopher tortoise.

Natural wildfires are believed to have maintained scrub communities as a low, open habitat suitable for these species. Exclusion of fire in these communities eliminates open sandy areas and can lead to succession from low scrub to xeric hammock (Veno 1976). Prescribed burning is highly recommended for wildlife habitat management in southern forests, especially those considered fire sub-climax communities. The proper size, frequency and time of burn are critical to the successful use of fire in managing wildlife habitat and maintaining biodiversity. The USFWS service recommends a fire return interval of every six to 12 years (USFWS 1999).

Mechanical clearance within scrub habitat is conducted to reduce the height of vegetation in LMUs where fire suppression has led to a large accumulation of fuels prior to conducting prescribed burns to reduce flame height and fire intensity, when prescribed fire is not a viable option due to safety and mission constraints. Additionally, sandy and/or sandy/herbaceous openings are created in areas where fire is not creating them to benefit wildlife. Recommendations for managing scrub as wildlife habitat, while supporting the mission include:

- Implement the 45 SW Scrub Habitat Restoration Plan (see **Appendix C, Attachment C-3**);

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- Utilize prescribed fire in LMUs to simulate the natural fire cycle IAW wildland fire management recommendations in **Section 7.10.3**;
- Employ mechanical methods to simulate the effects of fire when the use of prescribed fire is not feasible due to safety and mission constraints;
- Continue restoration and maintenance of LMUs, prioritizing those currently occupied by federally listed species (e.g., scrub-jays), IAW current BOs.
- Monitor and control invasive species (e.g., Brazilian pepper) to promote desirable native species;
- Maintain 30-foot wide clear zone around JDMTA fence for safety and security purposes through regular mowing to prevent scrub habitat from establishing in this area; and
- Monitor scrub health indicator species (i.e., Florida scrub-jay, gopher tortoise) annually in scrub habitat.

7.9.3 Beach Dunes and Coastal Grassland/Strand Community Management

Beach dune habitat is found at both CCAFS and PAFB, while coastal grassland and strand vegetative communities are found at CCAFS only. Portions of coastal strand on CCAFS have been cleared for the construction of a number of launch complexes and other developments. Future construction should be directed away from this community type on CCAFS. Historically, coastal strand occurred in a long, unbroken band along Florida's Atlantic coast. Now, it is considered one of the most endangered of Florida's communities because its location makes it a prime target for development. Occurrences of coastal strand on managed areas such as CCAFS may soon represent the only remaining undisturbed examples of this community. Coastal strand is subject to frequent natural disturbances from storms and overwash. Management of these community types is focused on impact avoidance and the restoration and enhancement of these communities

The 45 SW CES routinely programs for projects involving dune and beach restoration and enhancement projects. This has included installation of dune crossovers, planting of dune vegetation, beach tilling, beach escarpment removal and installation of dune berms. Tilling and escarpment removal have been conducted IAW beach restoration on nourished beaches by preventing sand compaction and steep slopes. Native dune plants have been planted in areas where storm surge has scoured away existing vegetation. The 45 CES installed sand fencing along with a recent beach nourishment project at PAFB to encourage dune rebuilding and re-vegetating. Sand fencing has also been installed at CCAFS on sections of the beach where dune vegetation is scarce or nonexistent, or in areas where the profile of the beach is extremely flat. As funding allows, the 45 SW will continue to conduct dune/beachfront plantings IAW the following management recommendations:

- Implement appropriate stormwater and erosion control BMPs when conducting restoration and enhancement activities (see Section 7.16);
- Implement restoration and enhancement projects within these communities between November and April to avoid sea turtle nesting/hatching season;

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- Manage invasive species (e.g., *Vitex* spp.) along the CCAFS and PAFB beaches to promote desirable native species; and
- Conduct coastal and marine resources management measures (see **Section 7.14.8**).

7.10 Wildland Fire Management

Primary Regulatory Drivers

- SAIA
- AFI 32-7064
- Florida Prescribed Burning Act (Section 590.125 of F.S.)
- FAC 5I-2 (Open Burning)

Fire is a natural process in Florida's vegetative communities and has been a major factor in ecosystem and vegetation development at the 45 SW properties. Similarly, wildlife species inhabiting those ecosystems have also learned to survive periodic wildfires and consequently have become dependent on various aspects of this fire cycle. Recurrent wildland fire is important for maintaining the majority of Florida's habitats including the flatwoods, hammocks, and scrub habitats found on the 45 SW properties, which are critical for many rare species. Wildland fires include unplanned wildfires and scheduled prescribed burns.

The WFMP is the primary planning tool for the wildland fire program and presents the program in detail. This Section of the INRMP is meant to integrate with the rest of the natural resources program and provide a summary of the wildland fire program, particularly fire ecology and prescribed fires, and associated guidelines. Its purpose is to convey the methods and protocols necessary to minimize wildfire frequency, severity, and size, while conducting beneficial prescribed burns and supporting the military mission. The WFMP was developed in cooperation with the USFWS; it defines the responsibilities of all offices, departments, and agencies involved. A copy of the WFMP is included as **Appendix J**.

7.10.1 Wildfire Management

Throughout history, wildfires were so prevalent in Florida that fire-dominated ecosystems evolved. However, since European settlers arrived in Florida, wildfire suppression has been employed to protect people and property. Suppressing naturally occurring wildfires allows the build-up of vegetative fuel loads and adversely affects the health of the vegetation communities and their habitat quality for indigenous wildlife species, as well as ultimately increasing risks to people and property. The 45 SW installations with unimproved land that present a wildfire hazard include CCAFS, PAFB, MTA and JDMTA. When these lands were acquired by the USAF, the suppression of wildfires was mandated for the protection of personnel and property, which has ultimately led to increased fuel loads over the years on the 45 SW properties.

The loss of personnel or facilities resulting from a wildfire has not occurred on the 45 SW, but the potential does exist. To date, the primary impact has been associated with smoke and particulates on flight hardware and/or payloads at launch pads or processing facilities at CCAFS. Smoke contamination in "clean rooms", whether at the payload processing facility or at the launch complex, can contaminate sensitive components on launch hardware and satellites resulting in launch failure, payload failure, launch schedule delay, and range schedule impacts. On PAFB, a wildfire could adversely affect launch support activities, aircraft flight operations,

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installation operations, and access. At MTA and/or JDMTA, a wildfire could impact the ability of those sites to support the DoD, NASA or commercial launches from CCAFS or KSC. The WFMP lays out specific guidance, procedures, and protocols for the prevention, detection, and suppression of wildfires on the 45 SW properties. For more information on wildfire management, refer to the WFMP in **Appendix J**.

7.10.2 Prescribed Fire

Prescribed fire is the purposeful application of fire in a controlled, knowledgeable manner. Prescribed fire may be used to accomplish hazardous fuels reduction and in turn minimize the risk of catastrophic wildfires, to improve wildlife habitat, and to manage invasive species or pests, and to perpetuate fire-dependent species. The use of prescribed fire has been used as a management tool on CCAFS and MTA. However, prescribed fire has not been used at PAFB or JDMTA. Wildfire risk is low at PAFB given the majority of the site consists of either developed land or well maintained grasslands. JDMTA contains vegetation communities that could burn if ignited under the right weather conditions; however, these areas are limited in size and discontinuous, which facilitates containment and minimizes the potential for spread into the adjacent JDSP. In addition, JDSP personnel periodically burn the land adjacent to the JDMTA, which further minimizes the potential for wildfires on JDMTA.

Due to the absence of fire on MTA dating back to World War II, a dangerous amount of fuel has formed within fire-dependent vegetation communities, such as the oak hammock and pine flatwoods communities. In 2005, the City of Palm Bay Fire Department and the FFS conducted a prescribed fire on approximately 100 acres in the northwest quadrant of MTA. The potential for a catastrophic wildfire is further elevated by the fact that the installation is surrounded by private residences and commercial development. Furthermore, the site has a history of wildfires being ignited by lighting and arson. While MTA would benefit greatly from additional prescribed burns and has conducted one in the past, the use of prescribed fire is not planned in the future due to various constraints (e.g., public perception and local smoke concerns). Mechanical clearing and thinning of small areas of the fire-dependent vegetation communities on MTA has been conducted almost annually since 2000 to reduce fuel loads on-site and attempt to minimize the risk of wildfire; this is conducted as funding allows. .

To facilitate natural resources management on 45 SW properties, CCAFS, PAFB and MTA have been divided into land management units (LMUs) or compartments. See **Figures 7-1, 7-2, and 7-3** for a depiction of these LMUs. These compartments are delineated by roads, firebreaks, lines-of-sight, canals and other natural and man-made barriers. See **Attachment J-2** in **Appendix J** for additional information. Currently, prescribed fire is only implemented on CCAFS. For approximately 50 years, fire was suppressed at CCAFS, which resulted in a significant accumulation of fuels in these fire-dependent communities and an imminent danger to USAF and contractor facilities and personnel on the installation. The 45 SW divided CCAFS into 173 land management units (LMUs) totaling 12,184 acres. These LMUs are classified as good, fair, poor, or not scrub habitat. The first prescribed burn conducted by the 45 SW on CCAFS was ignited in 1992 in compartment number 116.

A burn box and trench burning are two types of air curtain incinerators (ACIs) that can be used as an alternative to fuel reduction, by burning in a closed container or trench. ACIs are efficient,

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environmentally friendly, and a technically viable approach to dispose of burnable waste materials, and is an alternative to current fuel reduction methods for pile burning (USDA 2002). Trench burning is used more often than the burn box on CCAFS, especially in areas with a large amount of overgrown vegetation. The ACI approach efficiently disposes of large quantities of forest waste products at very high temperatures with very little air emission (USDA 2002).

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Figure 7-1. Land Management Units, CCAFS

Figure 7-2. Land Management Units, PAFB

Figure 7-3. Land Management Units, MTA

Approximately 8,000 to 10,000 acres of CCAFS is covered by vegetation communities that require prescribed fire to maintain vegetation composition and structure, experienced natural fire historically on a rare occasion, or developed due to a lack of fire over the years. Scrub communities require rare to occasional fire and the prescribed fire frequency varies dependent upon the scrub type and site conditions. For example, on Florida's Atlantic coast the openings in scrub habitat disappear as soon as three to five years post-fire (Schmalzer 2003, Schmalzer and Hinkle 1992, Breininger et al. 2001 cited in FWC and FNAI 2010). Oak-dominated scrub on the Lake Wales Ridge likely burned (naturally) at frequencies between 5 to 20 years (Main and Menges 1997 as cited in FNAI 2010); the lower limit of five years is based on the estimated time required for re-sprouted oaks to produce acorns (important component of scrub-jay diet) (Ostertage and Menges 1994 as cited in FNAI 2010). FWC recommends the fire frequency in scrub habitat managed for the scrub-jay is based on vegetation height rather than a prescribed fire frequency (FWC and FNAI 2010). As feasible, the 45 SW will conduct prescribed fires in oak-dominated scrub habitat to maintain optimal vegetative height for the scrub-jay (generally below 5.5 feet and open, sandy areas of 10% to 50% within the habitat (FWC and FNAI 2010). Rosemary plants reproduce by seed, and rosemary scrub prescribed fire intervals range from 10 to 40 years (FNAI 2010) based on life history of rosemary. Rosemary begins to produce seed at approximately 10 years, and shrub die back and reduced seed production typically occurs around 40 years (Johnson 1982 as cited in FNAI 2010). Sand pine scrub may have naturally burned at intervals of more than 10 years; the fire kills the sand pine trees and the sand pine cones open for seed dispersal after a fire (FNAI 2010). Occasional fire during the dry season occurs in basin marsh habitat with the frequency being dependent on hydrology and exposure to fire from surrounding areas. In addition, tropical hammock likely experienced periodic fire from surrounding areas. Other natural vegetative types on CCAFS are likely the result of fire suppression; xeric hammock, live oak/saw palmetto hammock, and live oak/saw palmetto shrubland.

Prescribed fire should not threaten the 45 SW mission because burning must be scheduled around mission restrictions such as launch operations, training, and other mission requirements. However, smoke (especially particulate and hydrocarbons) is a significant constraint to the 45 SW prescribed fire program. Smoke concerns include impacts to processing facilities and launch complexes: transport of equipment, clean room contamination, ash/particulate fallout, electronic equipment impact, and visibility and breathing impairments. Therefore, prescribed fires are coordinated in such a way to prevent impacts to sensitive facilities/equipment/personnel. Smoke concerns by residents surrounding MTA have resulted in no future prescribed fire being planned even though this site would benefit from fire.

The 45 SW WFMP lays out specific guidance, procedures, and protocols for planning and conducting prescribed burns at CCAFS. For more information on CCAFS fuel loads, LMU status, future prescribed burn activities, and mapping, refer to the WFMP (**Appendix J**).

7.10.3 Management Strategies

Specific wildland fire management practices conducted at the 45 SW properties are included below:

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- Consult with AFCEC Wildland Fire Center to accomplish a wildland fire management plan (WFMP) and for wildland fire management activities;
- Ensure 45 SW personnel participating in wildland fire activities are trained to the level required for their expected duties;
- Use prescribed fire to enhance the quality of CCAFS scrub habitat for the federally threatened Florida scrub-jay IAW the BO;
- Use prescribed fire to reduce vegetative fuels accumulated as a result of fire suppression at CCAFS to minimize the threat of catastrophic fires, and maintain compartments previously burned to keep fuel loads at a manageable level;
- Conduct prescribed burns within CCAFS on an average of 300 acres per year over a 10-year period; annual goal is 500 acres per year.
- Prioritize prescribed burn compartments at CCAFS with higher fuel loads;
- Conduct mechanical clearance to reduce the height of vegetation in compartments where fire suppression as led to a large accumulation of fuels prior to conducting prescribed burns to reduce flame height, fire intensity and the number of spot-overs;
- Implement mechanical clearing and thinning in vegetative communities with high fuel loads on MTA and CCAFS when prescribed fire is not feasible due to constraints (e.g., smoke) to minimize the threat of wildfire;
- Continue to explore opportunities to utilize prescribed fire at MTA in the future;
- Maintain the existing network of firebreaks at all 45 SW installations and create new firebreaks as required;
- Evaluate weather conditions continually to measure local weather conditions prior to and during wildland fires in order to identify factors with the potential to influence fire behavior;
- Ensure burn plans include the following smoke management components: actions to minimize prescriptive fire emissions, methods for evaluating smoke dispersion, public notifications and exposure reduction procedures, and air quality monitoring of sensitive receptors; and
- Obtain annual approval for the CCAFS WFMP and for prescribed fire plans established for MTA, as applicable.

7.11 Agricultural Outleasing

Primary Regulatory Drivers

- AFI 32-7064

The 45 SW lands are generally not suitable for agricultural operations. In 1983, and 1984, the US Department of Agriculture Soil Conservation Service determined that neither CCAFS nor MTA are suitable for agriculture based on the soil conditions and mission constraints on the installation. Soils on CCAFS would not provide adequate natural fertility and would encounter severe to moderate seedling mortality. Furthermore, the soils are highly permeable and therefore have low water capacity. Soils at MTA were found to be unsuitable for any agricultural purposes. Organic matter and natural fertility was deemed low. The majority of PAFB is developed and used to support

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the mission, while JDMTA is only 11 acres and contains mission essential infrastructure. Due to lack of suitable land for agricultural activities, the 45 SW does not support an agricultural outleasing program.

7.12 Integrated Pest and Invasive Species Management

Primary Regulatory Drivers

- Federal Noxious Weed Act
- Federal Insecticide, Fungicide & Rodenticide Act
- National Aquatic Invasive Species Act
- AFI 32-1053
- EO 13112
- FAC 5B-57 (Noxious Weeds)
- FAC 5B-64 (Prohibited Aquatic Plants)

Invasive and exotic species may include plants, insects, or animals. An **invasive** species is defined as "any native or alien species whose lack of control or introduction does or is likely to cause economic or environmental harm or harm to human health." An alien (or **non-native**) species is defined as a "species including its seeds, eggs, spores, or other biological material capable of propagating that species that is not native to that ecosystem (EO 13112)." Because of their invasive capacity, many exotic species have the ability to spread rapidly through ecosystems since their natural predators are often not present. Such species often retard natural succession and reforestation and generally cause a reduction of biological diversity in natural ecosystems.

Noxious weeds are defined as "any living stage (e.g., seeds and reproductive parts) of any parasitic or other plant of a kind, or subdivision of a kind, which is of foreign origin, is new to or not widely prevalent in the United States, and can directly or indirectly injure crops, other useful plants, livestock, or poultry or other interests of agriculture, including irrigation, or navigation or the fish and wildlife resources of the United States or the public health (Federal Noxious Weed Act of 1974)."

7.12.1 Integrated Pest Management Program

The 45 SW has an Integrated Pest Management (IPM) Program implemented by the IPMP (see **Appendix L**). IPM is the use of multiple techniques in a compatible manner to avoid damage and minimize adverse environmental affects while obtaining control of target pests. The goal of IPM is to utilize non-chemical procedures to control pests, including invasive, exotic plant and animal species. Typically a combination of the following IPM techniques is required to resolve a problem on a sustained basis:

- Mechanical control, which alters environments in which pests live, traps or removes pests (e.g.., glue boards and live-traps) from where they are not wanted, or excludes pests from where they are not wanted (e.g., screening, fencing);
- Cultural control, which manipulates environmental conditions to suppress or eliminate pests (e.g.., removal of food scraps or spreading manure on fields);
- Biological control, which uses predators, parasites, or disease organisms to control pests; and

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- Chemical control, which relies on pesticides (insecticides, rodenticides, herbicides, fungicides, etc.) to kill pest and/or undesirable species of plants.

The IPMP includes pest identification and management requirements, outlines the resources necessary for surveillance and control, and describes the administrative, safety, and environmental requirements of the program. The IPMP serves as a tool to reduce pesticide use, enhance environmental protection, and maximize the use of IPM techniques safely. It is the policy of the 45 SW to minimize the use of all pesticides, including herbicides, at the installation. The 45 CES/CEIC-P has been designated by the Commander to oversee the preparation and revision of the 45 SW IPMP, to coordinate with applicable agencies as appropriate, and evaluate the implementation of the IPM strategy and program annually during Environmental, Safety and Occupational Health Compliance Assessment and Management Program (ESOHCAMP). As part of this effort, the 45 CES/CEIE-C will meet with pest management personnel annually at a minimum to discuss BMPs, pesticide application techniques, chemical usage, wildlife impacts, and other management issues. The 45 CE Operations Pest Shop personnel and pest management contractors must review and provide applicable data for the 45 SW IPMP.

7.12.2 Invasive Species on 45 SW Installations

Invasive, non-native species and noxious weeds have the capability to significantly impact native vegetation and wildlife. A key element of INRMP implementation is to ensure “no net loss” of the 45 SW’s mission capability. Management of undesirable species is necessary to maintain installation lands and facilities in usable condition. In addition, uncontrolled animal pests can become health hazards, which could threaten the mission.

Over the years, numerous surveys have identified non-native plants on the 45 SW properties, including in-house observations during other activities. **Table 7-1** provides a summary of invasive and noxious species with known occurrence on CCAFS, PAFB, MTA and/or JDMTA. Of the 31 species identified, 12 of them are considered a very high or high priority by 45 SW for management due to their prevalence on the 45 SW installations, their ability to spread rapidly, and/or how difficult they are to control. These species are also found on the Florida Exotic Pest Plant Council (FLEPPC) list and/or the noxious weed list. Species with medium or low priority are also found on one of these lists, but are either less prevalent or are less likely to become a problem at the 45 SW properties. More information on invasive plant species is found in the Invasive Plant Species Control Plan in **Appendix G**.

The most common invasive plant on the 45 SW properties is the Brazilian pepper (*Schinus terebinthifolius*). The Brazilian pepper is considered a very high priority species for management due to its ability to spread quickly and the difficulty of controlling it once it becomes established. Typically, it dominates roadsides and disturbed areas on the installations. Along the roadsides the plant forms a dense perimeter that gives way to native vegetation within 50 to 100 feet of the mowed area along the roadways. In the disturbed areas the species is found as both isolated individuals and more extensive infestations.

Cogon grass is also a very high priority invasive species due to its occurrence all on four installations; this invasive species is hard to control once established. At CCAFS, cogon grass is

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found along roads and other disturbed sites. At PAFB, it is found on the airfield, while patches are dispersed within portions of MTA and JDMTA.

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Table 7-1. List of Noxious and Invasive Plant Species on 45SW Properties

Common Name	Scientific Name	FLEPPC Category[1]		Listed Noxious Species[2]	45 SW Priority	Occurs on Installation			
		I	II			CCAFS	PAFB	MTA	JDMTA
Air potato	*Dioscorea bulbifera*	✓		✓	Medium	✓			
Alligator weed	*Alternanthera philoxeroides*		✓		Low			✓	
Australian pine	***Casuarina equisetifolia***	✓		✓	**High**	✓	✓	✓	
Brazilian pepper	***Schinus terebinthifolius***	✓		✓	**Very High**	✓	✓	✓	✓
Camphor tree	*Cinnamomum camphora*	✓			Low			✓	
Carrotwood	*Cupaniopsis anacardioides*	✓		✓	Medium			✓	
Castor bean	*Ricinus communis*		✓	✓	Medium	✓			
Chaste tree	***Vitex trifolia***		✓		**High**	✓	✓	✓	
Chinese tallow tree	*Sapium sebiferum*	✓		✓	Medium			✓	
Cogon grass	***Imperata cylindrica***	✓		✓	**Very High**	✓	✓	✓	✓
Common guava	***Psidium guajava***	✓			**High**	✓		✓	
Earleaf acacia	***Acacia auriculiformis***	✓			**High**	✓			✓
Elephantgrass	*Pennisetum purpureum*	✓			Low	✓			
Hydrilla	*Hydrilla verticillata*	✓			Low		✓		
Java plum	*Syzygium cumini*	✓			Low			✓	
Lantana	*Lantana camara*	✓		✓	Medium	✓		✓	
Melaleuca	***Melaleuca quinquenervia***	✓		✓	**High**	✓	✓	✓	✓
Mimosa	***Albizia julibrissin***	✓			**High**	✓	✓	✓	
Natal grass	*Melinis repens*	✓			Medium	✓		✓	✓
Old World climbing fern	***Lygodium microphyllum***	✓		✓	**High**			✓	
Paragrass	*Urochloa mutica*	✓			Medium	✓		✓	
Peruvian primrose willow	*Ludwigia peruviana*	✓			Medium	✓		✓	
Rattlebox	*Sesbania punicea*		✓		Low			✓	
River sheoak	*Casuarina cunninghamiana*		✓		Low	✓			
Rosary pea	*Abrus precatorius*	✓		✓	Medium	✓		✓	✓
Schefflera	***Schefflera actinophylla***	✓			**High**				✓
Surinam cherry	*Eugenia uniflora*	✓			Low	✓			
Torpedo grass	***Panicum repens***	✓			**High**	✓	✓	✓	
Wedelia	***Sphagneticola trilobata***		✓	✓	**High**		✓		
Wild balsam apple	*Momordica charantia*		✓		Low	✓		✓	
Wild bushbean	*Macroptilium lathyroides*		✓		Low	✓		✓	

Source: USDA-NRCS 2014a, VZ Technologies et al. 2014b, FLEPPC 2013, Reyier et al. 2011, Gulledge et al. 2009

[1] FLEPPC Ranking:
CATEGORY I = Invasive exotics that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives.
CATEGORY II = Invasive exotics that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species.

[2] Noxious and invasive species as listed in FL Rule 5B-57.007 Noxious Weed List.

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Other high priority species of concern for the 45 SW include Australian pine, chaste tree, common guava, earleaf acacia, hydrilla, melaleuca, mimosa, Old World climbing fern, schefflera, torpedo grass, and wedelia. In an effort to control and/or eradicate noxious and invasive plant species known to occur on the 45 SW installations, the 45 CES/CEIE-C developed an invasive species control policy as well as an invasive plant species control plan for CCAFS, PAFB, MTA and JDMTA. Information on the prevalence of these species on the 45 SW properties and recommended management strategies for these high priority species of concern are included in **Appendix G.**

Additional information on invasive species identification, prevention, and control and management measures for Florida is available through a variety of sources. A summary of these sources is provided below.

- First Coast Invasive Working Group (http://www.floridainvasives.org/FirstCoast/Distribution/index.html) – provides invasive plant species information and distribution maps by species for Florida.
- FLEPPC (http://www.fleppc.org/list/list.htm) – maintains and updates a list of invasive plant species every 2 years and provides access to invasive species management plans and other related publications.
- Early Detection and Distribution Mapping System (http://www.eddmaps.org/tools/) – includes species information and distribution maps for plants and animal species.
- UF – Center for Aquatic & Invasive Plants (http://plants.ifas.ufl. edu/manage/) – provides guidance for managing plants in Florida waters.
- Nonindigenous Aquatic Species (http://nas.er.usgs.gov/queries/default.aspx) – provides species factsheets and collection information by state and drainage areas.

7.12.3 Guidelines for Invasive Species Management

The 45 SW will work to prevent the introduction of invasive species and take measures to control them in an economically and environmentally sound manner IAW laws and regulations pertaining to the management of these species. The task of controlling invasive and exotic species and noxious weeds is often expensive, lengthy, and risky because total eradication is required to prevent reestablishment. Prevention is the best approach. One of the most effective ways of preventing new invasive species is to limit all landscaping plants to only native species. See **Section 7.8** for more on landscaping with native plants.

The 45 SW will implement the following general management strategies when feasible:

- Implement BMPs to minimize land disturbances that favor invasion of non-native species and re-vegetate disturbed areas with native species;
- Utilize mulches from 45 SW or certified-weed free sources to facilitate the establishment of native ground cover on impoverished soils;
- Maintain biodiversity and undisturbed habitat to maximize resistance to and competition with invasive species;

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- Control invasive and exotic species and noxious weeds through early detection, isolation of infested areas, and control of individual plants with physical, chemical or mechanical means, depending on the species;
- Favor basal application and spot treatment and avoid aerial or broadcast application of pesticides to improve mortality of invasive vegetation and prevent adverse impacts to native plants and wildlife, where feasible;
- Do not use invasive, non-native species in landscaping when feasible;
- Continue to reseed exposed soils using a certified weed-free native grass mix;
- Coordinate applicable Federal and state agencies prior to implementing new control measures to ensure they will not impact listed species; and
- Incorporate invasive species detection and prevention in the environmental awareness program.

The use of chemicals to control invasive and exotic species can hinder an installation's efforts to reduce usage of herbicides and pesticides. Therefore, it is important to prevent the initial spread of invasive and exotic species and address the spread of such species as early as possible to reduce the amount of required herbicide and pesticide applications, and reduce costs associated with treatment. The 45 SW will evaluate the threat of invasive species as well as the environmental impacts to the environment and permitting requirements of herbicide usage (if applicable) prior to implementing any eradication and/or control program.

To minimize the use of aquatic herbicides, the 45 SW has implemented biological control methods to manage hydrilla, elodea, and torpedo grass within the PAFB canals. IAW a FDEP aquatic weed control permit, the 45 SW stocked triploid grass carp (TGC) in the canals to reduce these aquatic, invasive plant species to improve water flow and water quality. Additionally, the CE Operations has implemented aquatic weed harvesting using a barge and cutterhead to reduce density of aquatic invasive plants. Regular stocking of TGC is not anticipated due to the inability to prove success with previous stocking attempts.

7.13 Bird Aircraft Strike Hazard (BASH)

Primary Regulatory Drivers

- SAIA
- MBTA
- EO 13186
- AF 32-7064
- AFPAM 91-212

A BASH program exists for the airfields at CCAFS and PAFB. The MTA and JDMTA do not have airfields. Hazards include resident and migratory bird species and all other wildlife. Daily and seasonal bird movements can create hazardous conditions with airfield operations. For example, large frame aircraft deliver one-of-a-kind payloads for space launches to the CCAFS airfield and bird impacts to these aircraft could result in the loss of aircraft, crew and payload and may impact national security. A summary of hazards and BASH incidents is included in **Section 6.2.4**.

The 45 SW's BASH Plan (Operating Plan 91-212) establishes procedures to minimize these hazards at the 45 SW airfields (see **Appendix K**). The 45 SW BASH Plan supports AFPAM 91-212, BASH Management Techniques. The BASH Plan outlines the responsibilities of each

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organization involved with BASH and establishes methods that can be utilized to control and minimize the BASH. Implementation of specific portions of the plan is continuous, while other portions will be implemented as required by bird activity. No single solution exists for reducing BASH risk and a variety of techniques and organizations are involved in the BASH program.

Management and control measures for preventing bird-aircraft strikes include a number of operational and dispersal methods. Active harassment activities include a combination of "frightening devices" that are used whenever birds are present on the airfield or in the surrounding area. Frightening devices include vehicles, air cannons, screamer devices, and/or bird scare shot. In addition to active harassment, BASH management techniques include rodent control and depredation. Management of habitat, however, is the most effective and cost-efficient form of minimizing BASH risk. Management strategies include:

- Maintaining uniform grass height between 7 – 14 inches on the airfield;
- Removing or repairing old operating surfaces and broken tarmac, etc., from the airfield;
- Removing all trees in the airfield operating area;
- Avoiding landscaping that would attract wildlife on the airfield;
- Maintaining fencing to recommended standards;
- Using anti-perching devices where appropriate;
- Eliminating roosting areas;
- Maintaining rapid transition from airfield to forested areas to limit edge effect;
- Bird-proofing buildings and other structures; and,
- Prohibiting feeding or attracting birds or wildlife.

The 45 SW holds a Federal Depredation Permit for CCAFS and PAFB (see **Appendix B**). This permit allows for non-lethal methods of harassment of migratory birds in conjunction with lethal control and specifics on gun and shot used for control. Depredation and shooting is used as a last resort. Lethal means to control birds were first employed in 2000 at PAFB. No BASH depredation has occurred at CCAFS, although increased use of the Skid Strip may require depredation in the future. The 45 SW maintains a log of BASH strikes and depredation. Bird nest issues are dealt with on a case-by-case basis.

7.14 Coastal Zone and Marine Resources Management

The entire State of Florida and its territorial seas are located within the coastal zone. Therefore, all of the 45 SW installations are located within the coastal zone. CCAFS and PAFB are beachfront properties that are located along the Atlantic Ocean.

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Coastal and marine waters provide some of the most diverse and biologically productive habitat in the US, and support a large number of endangered and threatened species. This is especially apparent in estuaries, where fresh water and salt water mix. Coastal and marine waters are valued by many people in the US, both as a place to live and as a place to play. Because so many people are drawn to, or dependent on, coastal and marine waters, they are under considerable environmental stress, and protecting these resources is important. This Section identifies several protection measures for coastal and marine resources including coastal zone management; the protection of marine mammals, EFH, coral reefs, mangroves, and coastal barriers; beach cleanup and restoration activities.

Primary Regulatory Drivers

- CZMA
- Marine Mammal Protection Act
- MSFCMA
- CBRA
- Florida Manatee Sanctuary Act
- EO 13089
- Chapter 380, Part II, F.S.
- FAC 62B-33.004
- Rivers & Harbor Act

7.14.1 Coastal Zone

The CZMA authorizes a state-Federal partnership to ensure the protection of coastal resources. The FCMP was approved by NOAA in 1981 and is codified at Chapter 380, Part II, F.S. The FCMP has two fundamental goals: protecting coastal resources and helping Floridians maintain vital communities. The FCMP consists of a network of 24 Florida Statutes administered by eight state agencies and five Water Management Districts. The FDEP is charged with overseeing the state's coastal program. A copy of the FCMP guide can be found at: http://www.dep.state.fl.us/cmp/ publications/FCMP_Program_Guide_2014.pdf.

The FDEP has established a no development zone, delineated by the "Coastal Construction Setback Line", which is defined as the portion of the beach-dune system subject to severe fluctuations based on a 100-year storm surge, waves, etc. A "Fifty-foot Setback" is also established in which construction is prohibited within 50 feet of the line of mean high water of the Atlantic coast shoreline. The FAC 62B-33.004 exempts federally owned land from the restrictions of the coastal construction control line and setbacks. However, it is the policy of the 45 SW to limit beachfront development as much as practicable, with the exception of mission essential operations. Federal agency activities that have coastal effects must also undergo a Federal Consistency review IAW the CZMA. Federal Consistency Determinations are submitted through the NEPA/EIAP process to FDEP (Florida Clearinghouse) for projects that may affect lands, waters, or natural resources in the coastal zone. The comments of state agencies are incorporated into the NEPA documentation. Additionally, state and federal permits are not issued unless the permit is deemed consistent with the state CZMP. Therefore, an implied consistency determination is received when a permit is issued to the 45 SW.

Another important component of Coastal Zone Management Programs (CZMP) is the Coastal Nonpoint Pollution Control Program. Under Section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990, states and territories with approved CZMPs are required to develop and implement programs to control nonpoint source pollution from six main sources: agricultural, forestry, urban development, marinas, hydro-modifications (such as dams or stream channel modifications), and the loss of wetland and riparian areas. Nonpoint source pollution on

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45 SW properties is being monitored through the EMS. The maintenance of coastal and wetland habitat through restoration and enhancement activities are 45 SW objectives that support the reduction and elimination of nonpoint source pollution (see Objectives 4.1 and 4.2 in **Chapter 8** for more information).

7.14.2 Marine Animal Protection

The MMPA of 1972, as amended, prohibits harassment, hunting, capturing, or killing of manatees, sea otters, marine otters, whales, porpoises, dolphins, walruses, seals, sea lions, dugongs, and polar bears. The harassment definition also includes actions with potential to injure marine mammals by disruption of natural behavioral patterns including migration, surfacing, nursing, breeding, feeding, and sheltering.

Marine mammals that are found in waters adjacent to CCAFS and PAFB properties include the dolphin, right whale, smalltooth sawfish, and manatee. Under Section 4 of the ESA, critical habitat has been designated for northern right whales within the shallow coastal waters from Savannah, Georgia to Melbourne Beach, Florida (Melbourne Beach is located south of CCAFS and PAFB) because these coastal waters are the only known calving area for the right whale. Activities are not restricted in these areas, but the designation serves to alert the public of the importance of this offshore area and to exercise caution while in these waters. In addition, critical habitat for West Indian manatees is mapped within the Banana River and along the Atlantic Coast near CCAFS and PAFB (USFWS 2014f). Restrictions on boat use apply within portions of these waters. Additional protections are provided to the manatee under the Florida Manatee Sanctuary Act (see **Section 7.5.2.3** for more information on manatees). Additional marine animals found in the waters adjacent to CCAFS and PAFB that are protected under the ESA include the loggerhead, green, and leatherback sea turtles. Sea turtle management is discussed in **Section 7.5.1.1** and **Appendix C**. If in-water work is proposed, personnel involved with the project will comply with the NMFS *Sea Turtle and Smalltooth Sawfish Construction Conditions* (NMFS 2011).

The 45 CES/CEIE-C biologists are actively involved in aiding marine animals that have stranded or have been observed in distress on PAFB or CCAFS. A “call sheet” of all agencies responsible for wildlife aid response is maintained; in the case of a distressed animal, appropriate regulatory and rehabilitation personnel are alerted, and action is immediately taken by 45 CES/CEIE-C biologists. Whale and sea turtle live strandings/beachings have occurred on PAFB and CCAFS over the years, and excellent coordination and cooperation with federal, state, and private organizations has resulted in timely aid and care for the distressed animals.

7.14.3 Essential Fish Habitat

Federally funded projects or projects occurring on federal property are required to address EFH requirements, as mandated by the 1996 amendments to the MSFCMA. EFH can generally be defined as the waters and substrates necessary for fish for all stages of their life cycle (spawning, breeding, feeding and growth to maturity). Regional Fishery Management Council (FMCs) are responsible for designating EFH in their management plans for all managed species within the exclusive economic zone (EEZ), which is a managed fisheries area that extends from the shoreline to 200 miles offshore along the coastline of US waters. For the marine area

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surrounding CCAFS and PAFB, the SAFMC is the managing body. For a summary of EFH within the vicinity of the 45 SW installations, see **Section 5.3.1**.

Projects that may adversely affect species or submerged habitat types protected under the MSFCMA must undergo NMFS consultation pursuant to Section 305(b)(2) of the Act. The USAF will consult with NMFS at the earliest point in project design where it is possible to determine if there may be adverse effects to EFH to ensure all requirements, recommendations and/or best management practices (BMPs) can be incorporated into the design. Potential BMPs that could be instituted to minimize and/or avoid impacts to EFH could include, but not be limited to: inclusion of turbidity curtains, limiting work to certain times of the year to reduce species impacts, incorporate living shoreline designs into erosion control methods, and installing culverts that allow for the maximum hydrological flow and fish passage. The USAF will work with NMFS to establish the most appropriate BMP(s) for each project with potential to impact aquatic resources. For consultation, USAF must provide NMFS with a written assessment of the effects of that action on EFH. The level of detail in an EFH Assessment should be commensurate with the complexity and magnitude of the potential adverse effects of the action. The assessment must contain: (1) a description of the action, (2) an analysis of the potential adverse effects of the action on EFH and the managed species, (3) the federal agency's conclusions regarding the effects of the action on EFH, and (4) proposed mitigation, if applicable. If an expanded EFH consultation is necessary, the expanded consultation should also include: (i) results of an on-site inspection to evaluate the habitat and the site specific effects of the project, (ii) views of recognized experts on the habitat or species that may be affected, (iii) a review of pertinent literature and related information, and (iv) an analysis of alternatives to the action that could avoid or minimize adverse effects on EFH. If applicable, impacts to EFH will be addressed through consultation with NMFS, and any associated NEPA process.

Beginning in 2001, 45 SW CES contracted Olsen Associates, Inc. to map nearshore rock habitat as part of a beach profiling project for hurricane erosion beach restoration/ nourishment projects on PAFB beaches. Monitoring of the nearshore rock reef (sabellarid worm and coquina) has included water depth, dimensions of reef, algal cover, exposure, and recently hurricane fluctuations with sand transport. Due to funding, the baseline mapping of the rock reef will likely be conducted in the event of a hurricane (after massive storm erosion) as the mapping will be required to complete beach re-nourishment post-storm. The 45 SW will maintain this data in GIS to document any beach restoration effects to this EFH resource, and allow these changes to be illustrated.

The USAF understands compensatory mitigation may be required for projects that impact EFH. Compensatory mitigation will be addressed on an individual project basis (similar to the approach the USAF implements for impacts to threatened and endangered species habitat). In general, mitigation plans will include the following information: (1) existing habitats and condition of the mitigation site; (2) proposed construction details on how the site will be restored or enhanced; (3) potential functional lift (using the state of Florida Uniform Mitigation Assessment Method [UMAM] or a similar assessment tool); and (4) a monitoring and adaptive management program for gauging performance with respect to the established criteria. Under some circumstances, projects may provide advanced mitigation for EFH habitats. In those instances, the USAF will contact NMFS early in the process to ensure NMFS supports the technical design

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of the advanced mitigation project, and the accounting method for tracking advanced mitigation credits.

7.14.4 Coral Reef and Mangrove Protection

EO 13089 (*Coral Reef Protection*) directs the protection of coral reef ecosystems including endemic mangrove and seagrass ecosystems. Coral reef communities are not located in the waters off of CCAFS and PAFB. However, all three species of mangroves: red (*Rhizophora mangle*), white (*Laguncularia racemosa*), and black (*Avicennia germinans*) are present along the IRL system that parallels the western boundaries of PAFB and CCAFS. Most mangrove areas on and near 45 SW properties are composed of a few trees to small groupings along shorelines of waterways (river and connected canals); substantial mangrove swamps and forests are not present. Additionally, patchy to dense seagrass beds are interspersed throughout the IRL system adjacent to CCAFS and PAFB. Seagrass has also been observed in some of the basins on CCAFS that are inland from the lagoon system. Seagrass maps are maintained by the SJRWMD, but substantial "ground truthing" has not occurred along most of the waterways that parallel PAFB and CCAFS. However, limited seagrass surveys, tied to NASA actions have occurred within CCAFS.

In support of the DoD policy to protect and enhance "coral reef ecosystems" through educated management, the 45 CES/CEIE-C is working with the 45 SW Outdoor Recreation department to provide reef information to Self-Contained Underwater Breathing Apparatus (SCUBA) diving groups that are bused to south Florida where coral may be encountered. The 45 CES/CEIE-C is also providing general coastal and specific IRL ecosystem training for personnel that rent boats on CCAFS and PAFB and boat to other waters for fishing and recreation. Training courses are also being organized for base Security and base marina users to provide "environmentally friendly" boating practice information. Outreach opportunities such as local school presentations and community 'Earth Day' events are also targeted with educational information that illustrate wise boating and fishing to protect natural resources.

Florida implements a separate permitting program for trimming or altering mangroves under Section 403.9321 through 403.9333, F.S., although mangrove trimming and alteration can be incorporated into an ERP permit (see **Section 7.7.2**). Permits for trimming or altering mangroves are issued through FDEP.

7.14.5 Coastal Barrier Resources Act

Coastal barriers are unique landforms that serve as the mainland's first line of defense against the impacts of severe coastal storms and erosion, and provide protection for aquatic habitats. Tidal range and wave energy are dominant physical factors responsible for shaping coastal landforms. Coastal barriers are dangerous to build and live on. Certain actions and programs of the federal government have historically subsidized and encouraged development on coastal barriers, resulting in the loss of natural resources; threats to human life, health, and property; and the expenditure of millions of tax dollars each year. To remove the federal incentive to develop these areas, Congress passed the Coastal Barrier Resources Act (CBRA) of 1982 which designated relatively undeveloped coastal barriers along the Atlantic and Gulf coasts and made these areas ineligible for most new Federal expenditures and financial assistance.

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Approximately 3.1 million acres of land and associated aquatic habitat are part of the Coastal Barrier Resources System (CBRS). The USFWS maintains the repository for CBRA maps enacted by Congress that depict the CBRS. USFWS also advises federal agencies, landowners, and Congress if properties are in or out of the CBRS, and what kind of federal expenditures are allowed in the CBRS. None of the 45 SW properties are located within a CBRS. The nearest CBRS area is the Canaveral Unit (FL-07P, October 1990) which encompasses a significant area of the KSC property.

7.14.6 Coastal America Initiative and Beach Cleanups

The Coastal America Initiative was developed for coordination and cooperation amongst agencies in the restoration and protection of coastal areas. AFCEC is responsible for maintaining guidance. The 45 SW has not initiated any Coastal America Partnerships; however CCAFS and PAFB participate in the 'Keep Brevard Beautiful', 'Coastal America' and 'Ocean Conservancy' sponsored beach clean-ups twice a year. Both clean-ups are scheduled in conjunction with state (April) and international (September) beach clean-up efforts. Based on the approval of the 45 SW Commander, employees with permanent access badges for CCAFS are encouraged to bring guests and family members to help remove ocean borne debris from the beach. The PAFB beach cleanup is open to base personnel, their families, and the public.

The beach cleanup activity is primarily conducted to support the sea turtle nesting program on the 45 SW. Participants are directed to beach access points where plastic bags, refreshments, and trash receptacles are provided. Personnel of the 45 CES/CEIE-C provide assistance to participants while on the beach. Beach clean-ups typically attract over 100 volunteers who collect approximately 8 to 16 tons of trash per cleanup event (CCAFS and PAFB). Beach clean-ups conducted in the spring remove debris that would hinder nesting female sea turtles, and in the fall (September) a clean beach makes it easier for sea turtle hatchlings to reach the Atlantic Ocean.

7.14.7 Beach Nourishment

To date, there have been no beach nourishment activities at CCAFS. The beaches at CCAFS are generally increasing in size due to the littoral drift. The installation of sand fencing was completed previously along portions of the beach dune to aid in the restoration of these dunes that were impacted by overwash from hurricane activity, and provide net benefit to nesting sea turtles and native coastal flora.

Shoreline erosion along PAFB has been documented since 1948. Since that time, the average shoreline change rate over this Section has ranged from -0.5 feet per year to -1.0 feet per year. Thus, shoreline management for PAFB is an ongoing management concern to ensure the protection of habitat used by T&E species, beachfront facilities, beach-related recreation, and SR A1A. In 1992, PAFB initiated an ongoing beach nourishment project in an effort to rebuild portions of lost dunes. To date, restoration projects were conducted on the PAFB beaches in the 1990s, 2001, 2005, 2011, and most recently in 2014. Projects have included dune restoration, beach re-nourishment, and the planting of native coastal vegetation for dune stabilization. Due to the presence of EFH (see **Section 7.14.4**) on the southern end of the PAFB beach, only partial restoration is possible (i.e., above mean high water line). On the north end of

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PAFB beaches, a "full" beach restoration/template in permitted (i.e., fill in sand beyond the mean high water line).

Fill materials for the dune restoration will consist of poorly graded sands, and shall be free of unsuitable materials, such as silts, clays, organics, debris, or stone. Fill material will be obtained from approved borrow areas. The sand obtained shall be compatible with the PAFB beach sand. This includes, but is not limited to texture, color, fines content, organics, grain-size distribution, etc. Sand from CCAFS beaches have been used for beach re-nourishment projects on PAFB.

Since the PAFB beach is used as a nesting area by T&E sea turtles, any sand replenishment work should not be performed during the sea turtle nesting season, approximately 1 April through 31 October. If any of the work is performed during the months of April through October, the contractor must provide for nest surveys and relocations by experienced personnel with a valid permit from the FWC. Other conditions for sea turtle, sand compaction, escarpment formation/removal reporting, dredging protocol, etc., are also required per the Joint Coastal Permit and terms and conditions within the USFWS and NMFS Biological Opinions (BOs) (**Appendix B**) depending on the scope of the beach restoration. 45 CES/CEIE-C is required to work with the beach restoration contractors and the regulatory agencies to ensure conditions are followed and reports are submitted per T & E species/BO requirements.

7.14.8 Management Strategies

All actions, military and civilian, conducted by the 45 SW that may impact coastal and marine resources are evaluated and alternative approaches are considered that will result in the prevention or minimization of disturbance to these resources. Projects occurring in or near coastal and estuarine waters of the 45 SW properties are reviewed to assess potential impacts to coastal and marine resources through the NEPA/EIAP and through USFWS and NMFS consultation IAW the above laws and regulations.

- Consult with the 45 CES/CEIE-C prior to initiating projects with the potential to effect coastal/marine resources to determine if agency consultation, permits or other documentation is necessary;
- Adhere to all signage posted on the installation to further protect environmentally sensitive areas;
- Plan development to avoid impacts to coastal/marine resources to the maximum extent possible and mitigate unavoidable impacts;
- Adhere to BMPs during construction and operational activities as described in applicable manuals, plans and permits;
- Limit beachfront development at CCAFS and PAFB, to the extent practicable, with the exception of mission essential operations (e.g., rocket/missile launching and tracking facilities must be situated along the coast because of line-of-sight issues);
- Conduct Federal Consistency review for all projects on 45 SW that may affect lands, waters, or natural resources in the coastal zone;

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- Ensure construction activities and other projects in the waters adjacent to PAFB and CCAFS are conducted IAW FWC *Standard Manatee Conditions for In-Water Work* (FWC 2011) and *Brevard County Manatee Protection Plan and* FWC *Standard Manatee Conditions for In-Water Work* (see **Section 7.5.2.3**);
- Conduct NMFS consultation in the case of activities that may affect EFH;
- Incorporate and maintain data in 45 SW GIS for beach restoration, nearshore reef habitat, and other coastal resources to aid in shoreline management and planning efforts and document changes over-time; and
- Conduct annual beach cleanups in conjunction with state (April) and international (September) beach clean-up efforts.

7.15 Cultural Resource Protection

Cultural resources are historic and prehistoric properties as defined by the National Historic Preservation Act (NHPA), cultural items as defined by the Native American Graves Protection and Repatriation Act (NAGPRA), archaeological resources as defined by the Archaeological Resources Protection Act (ARPA), sacred sites as defined by EO 13007 to which access is afforded under the American Indian Religious Freedom Act (AIRFA), and collections and associated records as defined by 36 CFR 79.

The ICRMP (USAF 2012 draft, USAF 2009) describes known and potential cultural resources on CCAFS, PAFB, MTA and JDMTA and defines goals, objectives, guidance and procedures for managing them (see Chapter 2 of the ICRMP for the goals and objectives for the cultural resources management program). In particular the goals associated with plan integration, inadvertent discovery, and tribal and SHPO consultation are supported by this INRMP. For a complete summary of archeological resources and historic properties at the 45 SW properties, refer to Chapter 3 of the ICRMP. The 45 SW has several unique cultural resources issues related to the launch complexes, historic missile/rocket crashes, Man in Space Initiative and Cold War era; these issues are discussed in detail in Ch 6 of the ICRMP.

As discussed in **Section 2.4.1**, an INRMP is multidisciplinary by nature and must be integrated with other 45 SW plans, including the ICRMP. This section includes a brief overview of the primary laws and regulations protecting cultural resources and management strategies for safeguarding these resources during the implementation of this INRMP.

7.15.1 Regulatory Framework

The principal federal law addressing cultural resources is the NHPA of 1966, as amended (16 USC 470 *et seq.*), and it's implementing regulations (36 CFR 800). The regulations, commonly referred to as the Section 106 process, describe the procedures for identifying and evaluating historic properties; assessing the effects of

Primary Regulatory Drivers

- NHPA
- NAGPRA
- ARPA
- AIRFA
- EO 13007
- AFI 32-7065

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federal undertakings[4] on historic properties; and consulting to avoid, reduce, or minimize adverse effects. As part of the Section 106 process, federal agencies are required to consult with the State Historic Preservation Officer (SHPO). In the Florida, the Florida Division of Historical Resources (FDHR) is the SHPO.

Consultation with Native American tribes or nations is required under the provisions of the NHPA regulations, 36 CFR Part 800, and the NAGPRA and its implementing rules. Both statutes recognize the rights and privileges of federally recognized tribes or nations, but not tribes without federal standing or activist groups (Indians and/or non-Indians). The Bureau of Indian Affairs maintains a list of federally recognized tribes. Only federally recognized tribes or nations can participate in consultation under the provisions of these statues and their regulations. EO 13175 and Presidential Memoranda for *Heads of Executive Departments and Agencies on Government-to-Government Relations with Native American Tribal Governments* (29 April 1994) provide guidance for interacting and working with federally recognized American Indian, Alaskan Native, Native Hawaiian government and tribes.

7.15.2 Management Strategies for Cultural Resources

In accordance with AFI 32-7064, this section addresses the components of the natural resources program with the potential to affect cultural resources on the 45 SW installations. Activities or management practices undertaken by 45 SW that involve ground disturbance of any kind have the potential to impact cultural resources on CCAFS, PAFB, MTA and JDMTA. These activities may include land clearing, grading, revegetation, excavation, and maintenance (particularly between the Phillips Parkway and the Banana River shoreline). Thus, 45 SW natural resources management elements with the greatest potential to impact cultural resources include the enhancement of endangered and threatened species (e.g., Florida scrub-jay) habitat (**Section 7.5.1.2**), grounds maintenance (**Section 7.8**) vegetation habitat/forestry management (**Section 7.9**), wildland fire operations (**Section 7.10**), invasive species management (**Section 7.12**), and use of ATVs by 45 SW environmental and safety personnel (**Section 7.1.4**).

As discussed above, Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on historic properties and to consult with the SHPO to identify historic properties, potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize or mitigate any adverse effects on historic properties. Furthermore, federal actions also require government-to-government consultation with federally recognized tribes to address tribal concerns (past, present or future). These concerns should be addressed prior to reaching decisions on matters that may have the potential to significantly affect protected tribal resources, tribal rights, or Indian lands. For example, an archaeological survey may be required prior to initiating vegetation clearance activities on 45 SW properties if the area has not been previously surveyed and is deemed necessary by the FDHR or other consulting parties to ensure compliance with Section 106 of the NHPA. To ensure compliance with federal and state laws and the protection of 45 SW cultural resources, the USAF will implement the following procedures.

[4] An ***undertaking*** is defined in 36 CFR 800.16(y) as a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approval.

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- Contact the 45 CES/CEIE-C prior to initiating projects on 45 SW properties entailing construction, renovation or ground disturbing activities;

- Submit a consultation letter to FDHR and federally recognized tribes to invite them to participate in the project planning process and provide comments and/or concerns early in the EIAP process;

- Cease all activities immediately and follow SOP No. 3 (Inadvertent Discoveries) in Chapter 11 of the ICRMP, if any suspected human remains, cultural resources, tribal resources, or artifacts are discovered during construction, maintenance activities or as the result of natural erosion;

- Consult the 45 CES/CEIE-C staff archaeologist as new burn compartments are identified; and

- Ensure the three pre-burn planning checklists (45 CES Prescribed Burn Coordinator Checklist, Natural and Cultural Resource Checklist for Prescribed Fire Activities, and Controlled Burn Notification Checklist) are completed to protect natural and cultural resources in accordance with SOP No. 21 in Chapter 11 of the ICRMP.

7.16 Public Outreach

Primary Regulatory Drivers

- AFI 32-7064

Natural resource managers of the 45 CES/CEIE-C interact with the public to inform them of the natural resources at 45 SW installations and highlight the efforts that the USAF and the 45 SW have made to manage, conserve and protect the resources. Various public avenues are available in the local area to represent the 45 SW and the 45 CES/CEIE-C participate in as many of these public outreach activities as possible. Other activities involve educating and reading to base pre-school, local school children, and the Boy Scouts; authoring articles; conducting poster and oral presentations for off-base events; attending national and local conferences; and orchestrating beach cleanup.

Public sea turtle presentations and turtle walks are provided approximately twice a year to a limited number of base personnel during sea turtle nesting season. These activities are permitted by FWC and involve an educational slide show on the biology, nesting behavior and conservation of sea turtles. In addition, a guided nighttime turtle walk is conducted where participants can observe sea turtle nesting on the beach. Groups are selected by the CCAFS Commander and/or the 45 SW Commander.

Annual participation in the local Space Coast Birding and Wildlife Festival has been another effort of the 45 CES/CEIE-C to inform the public of the natural resources at 45 SW installations and to inform them of the USAF efforts in managing, conserving and protecting the resources as well.

7.17 Geographic Information Systems (GIS)

Primary Regulatory Drivers

- AFI 32-7064

Access to maps generated from accurate and usable GIS data is essential for efficient natural resources management

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at the 45 SW properties. In addition, it facilitates accurate analysis of potential effects of all future projects and activities.

The USAF centralizes GIS data within the GeoBase. The GeoBase supports installation mapping in which all of the utility, physical infrastructure, emergency response routes, explosive safety zones and other data are represented on a common GIS as separate mission data layers. General data is available for the facilities through the GeoBase, which serves as a master dataset. Site-specific natural resources GIS data for the 45 SW is maintained for CCAFS, PAFB, MTA and JDMTA. The 45 CES/CEIE-C also shares data with other organizations at the 45 SW and utilizes GIS data from other organizations when appropriate. The following **Table 7-2** provides a summary of GIS data currently available for the 45 SW properties.

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2 **Table 7-2. Summary of GIS Data Available for the 45 SW Properties**

GIS Data	45 SW Property	Source	Needs updating?
Boundaries	CCAFS, PAFB, MTA	GeoBase	No
Buildings	CCAFS, PAFB	GeoBase	No
Fences & Gates	CCAFS, PAFB, MTA, JDMTA	GeoBase	No
Transportation (pedestrian, roads, airfields, railroad, water docks)	CCAFS, PAFB	GeoBase	No
AICUZ	PAFB	45 SW	Yes, updated, as needed
Utilities (electric, fuel, sewer, wastewater, utility poles, water hydrants, and tanks)	CCAFS, PAFB, MTA, JDMTA	GeoBase	No
Environmental Restoration Program (plumes, SWMUs)	CCAFS, PAFB	AFCEC	Yes, is updated as new sampling/monitoring data available
Communication (antennas and towers)	CCAFS, PAFB, MTA, JDMTA	GeoBase	No
Recreation Areas	CCAFS, PAFB, MTA	45 SW	Yes
Elevations	All	Multiple Sources	Yes
Streams, lakes, watersheds, and other open water	CCAFS, PAFB, MTA	National Hydrology Dataset	Maybe. If NHD data is not accurate, then groundtruthed data should be created.
Wetlands	All	NWI	Yes NWI data is inaccurate. Groundtruthing wetland data should be compiled from previous surveys
Floodplains	All	FEMA	Yes
Florida Storm Surge & Coastal Hazards	CCAFS, PAFB, MTA, JDMTA	NOAA, FL Emergency Management	Yes, updated, as needed
Soils	All	NRCS	No
Natural Communities	CCAFS, PAFB, MTA, JDMTA	FNAI 2012, FL Cooperative Land Cover Map, version 2.3, Tallahassee, FL	Yes (updated as needed) Current data should include already documented vegetative communities
Land Cover	CCAFS	45 SW/other sources	Yes
Land Use	CCAFS, PAFB	45 SW/other sources	Yes
Rare species (and T&E) locations and areas	CCAFS, PAFB, MTA, JDMTA	45 SW	Yes (update annually) Current data should include known nesting areas and known potential habitat

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GIS Data	45 SW Property	Source	Needs updating?
Aerial Imagery	All	Multiple Sources	Multiple years are available
Scrub management	CCAFS, PAFB, MTA	45 SW	Yes (update as needed) Current data should include areas already treated, areas with potential to be treated, areas requiring following up and when
Invasive species populations	CCAFS, PAFB	45 SW	Yes; periodically (as needed)
Fire management	CCAFS	ESC/45 SW	Yes (updated as needed) Current data should include historical wildfire, historical prescribed fire, firebreaks, fuel loads

Note: GeoBase is the common US Air Force source for GIS data. 45 SW indicates data provided from 45 SW.

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Chapter 8. Management Goals and Objectives

This Section identifies the management goals and objectives for maintaining and improving the natural environment on the 45 SW installations. Each INRMP goal is supported by objectives that outline the strategy that will be used to achieve a stated goal. An objective supports a written goal by proclaiming more specifically the management action that must occur to accomplish each goal. An action can be completed using in-house resources, through cooperative agreements with other agencies and partners, or by contracted projects. Projects are typically programmed and funded through AFCEC. Each project or activity is written to be specific and time bound. Consequently, the goals and objectives become management targets that will allow the 45 CES/CEIE-C to quantitatively track the progress towards implementation of the INRMP.

The goals and objectives in this updated INRMP are a consolidation and continuation of the goals and objectives in the 2008 INRMP for the 45 SW. In some cases, previous goals and objectives have been combined to avoid repetition. The goals and objectives are supported by projects (subject to funding availability) and recurring natural resources management activities, which will allow the 45 SW to achieve the management goals and objectives. The consolidated goals, objectives, and resulting projects and recurring activities are summarized in **Table 8-1**. The implementation of some projects or activities will allow the 45 SW to meet multiple goals and objectives. In other words, a project or activity may occur under more than one objective. Detailed work plans for CCAFS, PAFB, MTA and JDMTA are included in **Chapter 10**.

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Table 8-1. Summary of Goals, Objectives and Management Actions for the 45 SW Installations (page 1 of 6)

Objective		Management Action	Installation				Timeframe	Planned Project/ Activity (see Ch. 10)
			CCAFS	PAFB	MTA	JDMTA		
GOAL 1: Protect federally listed T&E species and their habitat while ensuring mission sustainability								
1.1	Conduct management of Florida scrub-jay and habitat	1.1.1: Conduct population census	✓			✓	Annual (June/July)	Mgt., Species, FL scrub-jay
		1.1.2: Conduct banding of individuals	✓				Year-round	
		1.1.3: Monitor scrub-jay response to restoration activities	✓				Year-round	
		1.1.4: Restore / enhance / maintain scrub-jay habitat	✓				Year-round	Mgt., Species, T&E; Mgt., Habitat Readiness and Environmental Protection Integration (REPI) Lands
		1.1.5: Conduct prescribed burning of an average 300 acres / yr over a 10-year period	✓				Year-round	Mgt., Wildland Fire
		1.1.6: Complete annual BO reporting, as required	✓				Annual	In-house activity
1.2	Conduct management of sea turtles and habitat	1.2.1: Monitor nesting / hatchling success through participation in State and Index Nesting Beach Surveys	✓	✓			Annual (May-Oct)	Mgt., Species, Sea Turtles
		1.2.2: Complete annual report of all sea turtle monitoring activities	✓	✓			Annual	
		1.2.3: Conduct predator removal to decrease predation rates	✓	✓			Year-round	Mgt., Habitat, Coastal Dune
		1.2.4: Issue annual reminders to base personnel regarding sea turtle nesting season and lighting requirements	✓	✓			Annual	Mgt., Species, Sea Turtles
		1.2.5: Conduct light inspections to ensure compliance with Space Wing Instruction (SWI) 32-7001 and LMPs	✓	✓			Nesting season (minimum 5)	
		1.2.6: Conduct annual review of SWI 32-7001 to determine if revision is necessary	✓	✓			Annual	In-house activity
		1.2.7: Complete BO reporting, as required	✓	✓			Annual	In-house activity
		1.2.8: Restore / enhance sea turtle nesting habitat, as needed	✓	✓			As needed	Mgt., Habitat, Coastal Dune; Construct Back Dune
		1.2.9: Monitor population of juvenile green sea turtles in Trident Basin	✓				Biannual	Mgt., Species, Sea Turtles

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Table 8-1. Summary of Goals, Objectives and Management Actions for the 45 SW Installations (page 2 of 6)

Objective		Management Action	Installation				Timeframe	Planned Project/ Activity (see Ch. 10)
			CCAFS	PAFB	MTA	JDMTA		
1.3	Conduct management of SEBM and habitat	1.3.1: Conduct occupancy study in partnership with NASA and NPS	✓				Annual (Feb/Mar)	Mgt., Species, SEBM
		1.3.2: Conduct Five Year Demography Study	✓				2017	
		1.3.3: Conduct monitoring in select LMUs for SEBM occupation	✓				Year-round	In-house activity
		1.3.4: Ensure pest control operations are IAW BO	✓				Year-round	In-house activity
		1.3.5: Complete BO reporting, as required	✓				Annual or as required	In-house activity
1.4	Conduct management of eastern indigo snake and habitat	1.4.1: Conduct eastern indigo snake survey	✓	✓	✓	✓	2018/2019	Herptile/Indigo Snake Survey
		1.4.2: Implement indigo snake protection plan during construction activities	✓		✓	✓	As needed	In-house activity
1.5	Conduct management of American alligator	1.5.1: Respond to alligator calls; relocate non-nuisance alligators; call alligator trapper to remove nuisance alligators	✓	✓			As needed	In-house activity
		1.5.2: Conduct population surveys as needed	✓	✓	✓		As needed	In-house activity
1.6	Conduct management of federally-listed species and habitat	1.6.1: Document the presence of other federally listed T&E species	✓	✓	✓	✓	Year-round	In-house activity
		1.6.2: Conduct annual shorebird survey to document the presence of ESA listed bird species	✓	✓			Annual	In-house activity
		1.6.3: Review all BOs to determine if revisions are required	✓	✓		✓	Annual	In-house activity
		1.6.4: Review NEPA documentation, designs, site plans, work orders to ensure no adverse impacts to listed species	✓	✓	✓	✓	Year-round	In-house activity
		1.6.5: Conduct Section 7 consultations when actions have the potential to adversely impact a listed species	✓	✓	✓	✓	Year-round	In-house activity
		1.6.6: Implement the Reasonable and Prudent Measures and Terms and Conditions from all active BOs	✓	✓	✓	✓	Year-round	In-house activity

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Table 8-1. Summary of Goals, Objectives and Management Actions for the 45 SW Installations (page 3 of 6)

Objective		Management Action	Installation				Timeframe	Planned Project/ Activity (see Ch. 10)
			CCAFS	PAFB	MTA	JDMTA		
1.7	Conduct management of gopher tortoise and habitat	1.7.1: Conduct population survey / estimate	✓				2018/2019	Gopher Tortoise Survey
		1.7.2: Complete report for CCA	✓	✓	✓	✓	Annual	Mgt., Species, Gopher Tortoise
		1.7.3: Conduct gopher tortoise surveys and relocation to support various projects	✓	✓	✓	✓	Year-round	
		1.7.4: Conduct monitoring in select LMUs for gopher tortoise presence	✓				Year-round	
		1.7.5: Incorporate gopher tortoise relocation data into 45th Civil Engineering Geo Integration Office (GeoBase)	✓				2015	In-house activity
1.8	Implement nuisance wildlife program	1.8.1: Remove coyotes and feral hogs	✓		✓		Year-round	Mgt., Habitat, Coastal Dune
		1.8.2: Remove raccoons depredating sea turtle nests	✓	✓			Year-round	
		1.8.3: Complete steel trap reporting requirements and renew permit	✓				Biennial	In-house activity
GOAL 2: Manage native plants and animals by promoting biodiversity and utilizing methods to enhance these species and their habitats								
2.1	Conduct management of herpetological species and habitat	2.1.1: Complete survey of herpetological species and determine management actions	✓	✓	✓	✓	2018/2019	Herptile/Indigo Snake Survey
		2.1.2: Incorporate results of survey into INRMP	✓	✓	✓	✓	2017	In-house activity
2.2	Conduct management of aquatic species and habitat	2.2.1: Review fishing rules to determine if revision is required	✓	✓			Annual	
		2.2.3: Review project actions to determine impacts to fish species and their habitat, and conduct essential fish habitat consultation as required	✓	✓			Year-round	
2.3	Conduct management of migratory birds and habitat	2.3.1: Participate in Bird Hazard Working Group and coordinate wildlife / habitat management near the airfield IAW the BASH plan	✓	✓			Year-round	
		2.3.2: Complete annual depredation permit reporting requirements and renewal of permit	✓	✓			Annual	
		2.3.3: Conduct surveys for migratory bird nests prior to mechanical and/or prescribed fire treatment and mark areas to avoid destruction of nests	✓				Year-round	

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Table 8-1. Summary of Goals, Objectives and Management Actions for the 45 SW Installations (page 4 of 6)

Objective		Management Action	Installation				Timeframe	Planned Project/ Activity (see Ch. 10)
			CCAFS	PAFB	MTA	JDMTA		
2.3	Conduct management of migratory birds and habitat (***Continued***)	2.3.4: Conduct osprey census to assist natural resource managers in determining impacts to species from project activities	✓	✓			Annual	In-house activity
		2.3.5: Perform annual rooftop surveys for least terns and black skimmer	✓	✓			Annual	
		2.3.6: Perform annual shorebird surveys and submit data into Florida Shorebird Alliance database	✓	✓			Annual	
		2.3.7: Continue participation in PIF program	✓	✓	✓	✓	Year-round	
		2.3.8: Incorporate protection measures for migratory bird species during NEPA review of projects	✓	✓	✓	✓	Year-round	
2.4	Conduct management of white-tailed deer	2.4.1: Perform deer census as needed to determine if management actions are required	✓				As needed	In-house activity
GOAL 3: Manage invasive plant species to minimize impacts to native ecosystems and to support mission sustainability								
3.1	Control invasive plant species and monitor effectiveness of treatment	3.1.1: Identify and prioritize areas for invasive plant removal	✓	✓	✓	✓	Year-round	In-house activity
		3.1.2: Utilize mechanical methods and herbicide to remove and control invasive plant species	✓	✓	✓	✓	Year-round	Mgt., Habitat, T&E; Coastal Dune; REPI Lands; Invasive Species, Brazilian Pepper
		3.1.3: Monitor all areas previously treated and re-treat as needed	✓	✓	✓	✓	As needed	
GOAL 4: Employ ecosystem management principles to manage 45 SW natural resources and promote biodiversity								
4.1	Maintain coastal habitat through restoration and/or enhancement of coastal dunes, strands, and swales	4.1.1: Determine the condition of the coastal habitat and prioritize areas for restoration and/or enhancement based on impacts from erosion, storm damage and the presence and health of dune vegetation	✓	✓			Annual	In-house activity
		4.1.2: Re-nourish and replant coastal areas identified for restoration and/or enhancement	✓	✓			As needed	Mgt., Habitat, Coastal Dune; Construct Back Dune
		4.1.3: Conduct biannual beach cleanups	✓	✓			Biannual	In-house activity

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Table 8-1. Summary of Goals, Objectives and Management Actions for the 45 SW Installations (page 5 of 6)

Objective		Management Action	Installation				Timeframe	Planned Project/ Activity (see Ch. 10)
			CCAFS	PAFB	MTA	JDMTA		
4.2	Maintain wetland habitat through restoration and/or enhancement	4.2.1: Identify and analyze all impounded wetlands and manmade barriers inhibiting connections between estuarine wetlands and the Banana River	✓				Annual	
		4.2.2: Restore and/or enhance wetlands identified in 4.2.1 by removal of barriers, installing culverts, etc. to restore natural connections between estuarine wetlands and the Banana River	✓				As needed	Mgt., Habitat, Wetlands; Monitor wetlands
		4.2.3: Prioritize and restore / enhance other wetland areas	✓	✓	✓		As needed	
4.3	Restore and/or enhance other disturbed or adversely impacted habitat	4.3.1: Identify and prioritize adversely impacted areas for restoration, such as abandoned lines of sight, spoil areas, staging areas and abandoned facilities / roads / pavement	✓	✓	✓	✓	As needed	In-house activity
		4.3.2: Restore adversely impacted natural resource areas	✓	✓	✓	✓	As needed	
GOAL 5: Develop and maintain a comprehensive data collection and processing system for management of 45 SW natural resources								
5.1	Update, organize, and prioritize natural resources data sets and information	5.1.1: Conduct annual assessments of all data collection and storage activities with the Installation Management GIS manager and the GeoBase POC	✓	✓	✓	✓	Annual	In-house activity
		5.1.2: Annually review natural resources hardware / software to ensure compatibility with USAF and GeoBase standards	✓	✓	✓	✓	Annual	
		5.1.3: Review GIS natural resources layers annually with base planners to ensure compatibility between base planning and natural resources conservation	✓	✓	✓	✓	Annual	
		5.1.4: Develop a list of data that is managed within GIS, data that is not managed but needs to be, and prioritize what data needs to be managed within GIS	✓	✓	✓	✓	2015	
5.2	Utilize natural resources data to support 45 SW decision-making	5.2.1: Use GIS in applicable NEPA analysis and project planning to identify, delineate and ensure protection to habitat required for long-term survival of wildlife	✓	✓	✓	✓	Year-round	
		5.2.2: Brief natural resources management annually to Wing leadership using GIS data	✓	✓	✓	✓	Annual	

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Table 8-1. Summary of Goals, Objectives and Management Actions for the 45 SW Installations (page 6 of 6)

Objective		Management Action	Installation				Timeframe	Planned Project/ Activity (see Ch. 10)
			CCAFS	PAFB	MTA	JDMTA		
GOAL 6: Protect 45 SW natural resources through training, education, and outreach and ensure compliance with applicable environmental laws and regulations								
6.1	Provide natural resources awareness to base personnel	6.1.1: Develop and conduct training for natural resources awareness at newcomers briefings, to base security personnel, EOD personnel, engineers, etc.	✓	✓	✓	✓	As needed	In-house activity
		6.1.2: Provide natural resources educational material such as brochures, posters, etc.	✓	✓	✓	✓	As needed	
		6.1.3: Educate base personnel through periodic articles in the base newspaper, website, EDASH, and global email notifications	✓	✓	✓	✓	As needed	
		6.1.4: Annual brief Wing leadership on natural resources including current active BOs and the requirements associated with each	✓	✓	✓	✓	Annual	
		6.1.5: Investigate how the 45 SW will re-establish and maintain a CLEP (full-time 45 SW CES/CEIE-C position lost)	✓	✓	✓	✓	2015	
6.2	Conduct educational outreach that promotes the 45 SW natural resources program	6.2.1: Participate in base and community events (turtle walks, bird and wildlife festival, briefings to schools, etc.)	✓	✓	✓	✓	As needed	In-house activity

Note: TBD = To Be Determined

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Chapter 9. Implementation, Update, and Revision Process

9.1 INRMP Implementation

9.1.1 Project Development

Management goals and objectives for the INRMP were developed through a thorough evaluation of the natural resources present on the 45 SW installations. IAW AFI 32-7064 and the principles of adaptive ecosystem management, subject areas were identified and management alternatives developed by an interdisciplinary team of ecologists, biologists, geologists, planners, and environmental scientists. **Chapter 7** presents the preferred management alternatives based on the professional opinions of the 45 SW INRMP Task Force; including the 45 CES/CEIE, USFWS, NMFS, and FWC. Through these evaluations, a set of natural resources management goals and associated projects have been established based on adaptive, ecosystem management (see **Chapter 8**).

This INRMP will be implemented through the various policies and programs described throughout the document and accomplishment of the goals and objectives as described in **Chapter 8**. The implementation schedule, project and activity lists, and how the projects relate to INRMP implementation are detailed in **Table 10-1** and **Table 10-2** in **Chapter 10**.

This INRMP is a living document that is based on short-, medium-, and long-term planning horizons. Short-term tasks include activities and projects that are planned to occur in 0 to 5 years, while medium-term tasks include activities and projects in a 6- to 10-year period. Long-term tasks are usually scheduled beyond 10 years. The majority of the tasks discussed in this INRMP are short and medium-term natural resources management tasks. Goals, objectives and tasks should be revised over time to reflect evolving environmental condition, adaptive management and the completion of tasks as the INRMP is implemented. In addition, medium- and long-term tasks should eventually become short-term tasks over time.

9.1.2 Project Implementation

IAW AFI 32-7064, an INRMP is considered implemented if an installation:

- Actively requests, receives, and uses funds for “must fund” projects and activities as defined by AFI 32-7001, *Environmental Quality Programming and Budgeting*;
- Executes all “must fund” projects and activities IAW specific time frames identified in the INRMP;
- Ensures that sufficient numbers of professionally trained natural resources management personnel are available to perform the tasks required by the INRMP;
- Reviews the INRMP annually and coordinates annually with cooperating agencies; and,
- Documents specific INRMP action accomplishments undertaken each year.

Natural resource and land use management issues are not the only factors contributing to the development and implementation of the INRMP. Facility management and other seemingly unrelated issues affect implementation. It is important to the implementation of this INRMP that

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45 SW personnel take ownership of the INRMP to provide the necessary resources (i.e., personnel and equipment), and to utilize the appropriate funding allocated by the AFCEC to enact the INRMP. It is extremely important that the INRMP Working Group continue to participate in the implementation of this INRMP. The INRMP Working Group is made up of the key 45 SW personnel, and has an oversight role to ensure the effective implementation of this INRMP. Top- and middle-level management representation, as well as representation from several individuals with day-to-day on-site experience will provide the INRMP Working Group with the leadership and structure necessary for the successful implementation of this INRMP.

Table 10-1 in **Chapter 10** provides an overview of recurring natural resource management activities for CCAFS, PAFB, MTA and JDMTA. These activities are generally performed by 45 SW CES/CEIE personnel. The implementation schedule and planned projects for this updated INRMP are detailed in **Table 10-2** in **Chapter 10**. **Table 10-1** and **Table 10-2** will be used to develop budget requests and schedule annual project requirements. Funding requests will be submitted IAW current AFCEC procedures for conservation projects.

9.1.3 Priorities and Scheduling

The Office of Management and Budget (OMB) considers funding for the preparation and implementation of this INRMP, as required by the SAIA, to be a high priority. However, the reality is that not all of the projects and programs identified in this INRMP will receive immediate funding. Therefore, projects need to be funded consistent with timely execution to meet future deadlines. Projects are generally prioritized with respect to compliance. Highest priority projects are projects related to recurring or current compliance, and these are generally scheduled earliest. As such, these projects have been placed into three priority-based categories: (1) high priority projects which are essential for maintaining compliance or for successful natural resources management, (2) medium priority projects with no immediate compliance requirement or less impact on the natural resources, and (3) low priority projects with a natural resources benefit but no legal driver. The prioritization of the projects is based on need, legal drivers, and ability to further implementation of the INRMP.

Recurring requirements include projects and activities needed to cover the recurring administrative, personnel and other costs that are necessary to meet applicable compliance requirements (i.e., ESA, BOs) or which are in direct support of the military mission. Recurring costs include manpower, training, supplies; hazardous waste disposal; operating recycling activities; permits and fees; testing, monitoring and/or sampling and analysis; reporting and record keeping; maintenance of environmental conservation equipment; and compliance self-assessments.

Current compliance includes projects and activities needed because an installation is currently or will be out of compliance if projects or activities are not implemented in the current program year. Examples include:

- Environmental analyses, monitoring, and studies required to assess and mitigate potential effects of the military mission on conservation resources;
- Planning documents;

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- Baseline inventories and surveys of natural and cultural resources (historical and archaeological sites);
- BAs, surveys, or habitat protection for a specific listed species;
- Mitigation to meet existing regulatory permit conditions or written agreements;
- Wetland delineations in support of subsequent jurisdictional determinations and consequent permitting; and
- Efforts to achieve compliance with requirements that have deadlines that have already passed.

Maintenance requirements include those projects and activities needed that are not currently out of compliance but shall be out of compliance if projects or activities are not implemented in time to meet an established deadline beyond the current program year. Examples include:

- Compliance with future requirements that have deadlines;
- Conservation and GIS mapping to be in compliance;
- Efforts undertaken IAW non-deadline specific compliance requirements of leadership initiatives;
- Wetlands enhancement, in order to achieve the executive order for "no net loss" or to achieve enhancement of existing degraded wetlands; and
- Public education programs that educate the public on the importance of protecting natural resources.

Lower priority projects include those that enhance conservation resources of the installation mission, or are needed to address overall environmental goals and objectives, but are not specifically required under regulation or EO and are not of an immediate nature. These projects are generally funded after those of higher priority are funded. Examples include:

- Community outreach activities, such as "Earth Day" and "Historic Preservation Week" activities;
- Educational and public awareness projects, such as interpretive displays, oral histories, nature trails, wildlife checklists, and conservation teaching materials;
- BAs, biological surveys, or habitat protection for a non-listed species;
- Restoration or enhancement of cultural or natural resources when no specific compliance requirement dictates a course or timing of action; and
- Management and execution of volunteer and partnership programs.

9.1.4 Funding

Implementation of this INRMP is subject to the availability of annual funding. Funding sources for specific projects can be grouped into three main categories by source: Federal USAF funds, other Federal funds, and non-Federal funds. When projects identified in the plan are not implemented due to lack of funding, or other compelling circumstances, the installation will

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review the goals and objectives of this INRMP to determine whether adjustments are necessary. The following discussion of funding options is not all-inclusive of funding sources. Many funding sources rely on a variety of grant programs, award criteria and amounts can change considerably from one year to another. Funding through grant programs can occur on a one-time award, annually or in multiples of years.

The AFCEC is the primary source of funding to support the management of natural resources at the 45 SW installations. This budget is managed by the 45 CES/CEIE Environmental Manager and Natural Resources Manager. The AFCEC provides funding for natural resource surveys, environmental monitoring projects, and compliance-related projects.

The Legacy Resource Management Program provides financial assistance to DoD efforts to conserve natural and cultural resources on Federal lands. Legacy projects could include regional ecosystem management initiatives, habitat preservation efforts, archeological investigations, invasive species control, and/or flora or fauna surveys. Project proposals are submitted to the Legacy program during their annual funding cycle.

There are also grant and assistance programs administered by other Federal agencies that could be accessed for natural resources management at the 45 SW installations. Examples include funds associated with the CWA and endangered species.

Other non-Federal funding sources that could be considered include The Public Lands Day Program, which coordinates volunteers to improve the public lands they use for recreation, education, and enjoyment, and the National Environmental Education and Training Foundation, which manages, coordinates, and generates financial support for the program.

State and local agencies are also a great source of additional resources. For example, the 45 SW CES/CEIE may consider entering into cooperative or mutual aid agreements with states, local governments, non-governmental organizations, and other individuals.

9.1.5 Natural Resources Management Staffing

The Natural Resources Program for the 45 SW is administered by the 45 CES/CEIE, and contractor support assists with natural resources activities at the 45 SW. The 45 CES/CEIE must coordinate and communicate within the internal command structure and with external stakeholders to convey the requirements of the INRMP and to develop integrative and cooperative approaches to natural resources management. All environmental personnel at the 45 SW are trained natural resource management professionals. All personnel responsible for implementing the INRMP are DoD employees. The 45th Civil Engineer Squadron Environmental Flight (45 CES/CEV) is the primary organization responsible for hiring and managing personnel associated with the INRMP. All 45 SW natural resource managers have attended the course *DoD Natural Resource Compliance* per the requirements of AFI 32-7064. Personnel responsible for the enforcement of fish, wildlife and natural resource laws receive the proper training on the enforcement of these laws. Furthermore, natural resource managers participate and attend conferences and training courses related to natural resource activities at the installation.

Responsibilities of the 45 CES/CEIE in regard to implementation of this INRMP include:

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- Providing oversight and coordination with other agencies;
- Developing and implementing programs to ensure the inventory, delineation, classification, and management of all applicable natural resources to include: forests, wetlands, listed species, sensitive or unique habitats, and other natural resource areas of special interest;
- Maintaining natural resources management records;
- Reviewing environmental documents (e.g., environmental impact assessments and remedial action plans) and construction designs and proposals to ensure adequate consideration of natural resources, while ensuring that technical guidance as presented in this INRMP is adequately considered;
- Evaluating impacts of military missions and providing guidance to military personnel regarding natural resources;
- Coordinating with the Cultural Resources Manager and Section 106 compliance;
- Coordinating with local, state, and Federal governmental and civilian conservation organizations relative to the 45 SW natural resources management program; and,
- Implementing and executing AFI 32-7064.

9.2 Annual INRMP Review and Coordination Requirements

Per DoD and USAF policy, the 45 SW will review the INRMP annually in cooperation with the USFWS, NMFS and FWC. On an annual basis, the 45 CES/CEIE will invite the USFWS local field office, NMFS field office, and FWC to attend a meeting or participate in a conference call to review previous year INRMP implementation and discuss implementation of upcoming programs and projects. Invitations will be either by letter or email. The meeting or teleconference will be documented with meeting minutes or a memorandum of record detailing each annual review. The 45 CES/CEIE will prepare these annual review documents and they will be appended in **Appendix A**.

At this annual meeting the need for updates or revisions will be discussed. If updates are needed, the 45 CES/CEIE will initiate the updates and after agreement of all three parties they will be added to the INRMP. If it is determined that major changes are needed, all three parties will provide input and an INRMP revision will be initiated with 45 CES/CEIE acting as the lead coordinating agency. The annual meeting will be used to expedite the more formal review for operation and effect and if all parties agree and document their mutual agreement, it can fulfill the requirement to review the INRMP for operation and effect.

If not already determined in previous annual meetings, by the fourth year annual review a determination will be made jointly to continue implementation of the existing INRMP with updates or to proceed with a revision. If the parties feel that the annual reviews have not been sufficient to evaluate operation and effect and they cannot determine if the INRMP implementation should continue or be revised, a formal review for operation and effect will be initiated. The determination on how to proceed with INRMP implementation or revision will be made after the parties have had time to complete this review.

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As part of the annual review, the 45 CES/CEIE will specifically:

- Invite feedback from USFWS, NFMS (including both the Protected Resources and Habitat Conservation divisions) and FWC on the effectiveness of the INRMP;
- Inform USFWS, NFMS and FWC which INRMP projects and activities are required to meet current natural resources compliance needs; and,
- Document specific INRMP action accomplishments from the previous year.

Information for the annual reviews comes from the 45 CES/CEIE staff, the 45 SW military leadership, cooperating agencies, project files, and AFCEC, as applicable. Cooperating agencies may request a site visit or status update through 45 CES/CEIE.

9.3 INRMP Update and Revision Process

Not less than every five years, the INRMP will be reviewed for operation and effect to determine if the INRMP is being implemented as required by the SAIA and contributing to the management of natural resources at the 45 SW installations. The review will be conducted by the four cooperating parties to include the Commander responsible for the INRMP, the Regional Director of the USFWS, the Atlanta Branch Chief of the NMFS and Director of the FWC. While these are the responsible parties, technical representatives generally are the personnel who actually conduct the review.

The review for operation and effect will either conclude that the INRMP is meeting the intent of the SAIA and only needs an update and implementation can continue; or that it is not effective in meeting the intent of the SAIA and it must be revised. The conclusion of the review will be documented in a jointly executed memorandum, meeting minutes, or in some other way that reflects mutual agreement.

If only updates are needed, they will be completed in a manner agreed to by all parties. The updated INRMP will be reviewed by the local USFWS and NMFS field offices in Florida and the FWC Director. Once concurrence letters or signatures are received from USFWS Field Office, NMFS Atlanta Branch Chief, and the FWC Director, the update of the INRMP will be complete and implementation will continue. Generally, the environmental impact analysis will continue to be applicable to updated INRMPs, and a new analysis will not be required.

If a review of operation and effect concludes that an INRMP must be revised, there is no set time to complete the revision. The existing INRMP remains in effect until the revision is complete and USFWS, NMFS and FWC concurrence on the revised INRMP is received. The 45 CES/CEIE will endeavor to complete such revisions within 18 months depending upon funding availability. Revisions to the INRMP will go through a more detailed review process similar to development of the initial INRMP to ensure 45 SW military mission, USFWS, NMFS and FWC concerns are adequately addressed, and the INRMP meets the intent of the SAIA.

9.3.1 INRMP Implementation Analysis

The primary measure of INRMP effectiveness is whether it helps prevent net loss in the capability of military lands to support the military mission. The 45 CES/CEIE-C is preserving its

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ability to support the military mission through the natural resources management practices outlined in the 2008 INRMP and in this update. Long-term management effectiveness is also evaluated through periodic inventories of species populations, habitat quantity and quality, and habitat values through recurring planning level surveys (PLSs). Trends can be used to indicate the degree of success. The 45 CES/CEIE will evaluate these recurring data as they become available.

A practical evaluation of INRMP implementation includes reviewing whether planned projects and activities have been accomplished. An analysis of the 2008 INRMP projects and activities for CCAFS, PAFB, MTA and JDMTA, and their implementation status is included in **Appendix A**.

Overall, 45 SW has benefited from the INRMP as a management tool. The program and goals in the 2008 INRMP were addressed through implementation of management actions. Most of the specific management actions have been implemented through in-house activities, while some have been projects. A large number of the projects and activities are recurring actions that are continued in this INRMP. However, several proposed management actions from the 2008 INRMP are no longer applicable and have been discontinued due to budget and manpower shortages. See **Chapter 8** for specific goals and objectives for each of the four installations, **Chapter 10** for the associated projects and activities proposed in this INRMP, and **Chapter 7** for a complete summary of the updated management recommendations and strategies.

9.3.2 Monitoring INRMP Implementation

9.3.2.1 45 SW INRMP Implementation Monitoring

Monitoring of INRMP implementation is necessary to facilitate the legal requirements of the SAIA for review for operation and effect (see discussion above). These SAIA implementation criteria do not necessarily measure the effectiveness of an INRMP in facilitating mission accomplishment while conserving natural resources. The 45 SW INRMP implementation will be monitored for meeting the legal requirements of the SAIA as well as for other mission and biological measures of effectiveness.

The ultimate successful implementation of this INRMP is realized in no net loss in the capability of the 45 SW training lands to support the military mission while at the same time providing effective natural resources management. Initiation of projects is one measure that is used to monitor INRMP implementation, but it does not give the total picture of the effectiveness of the natural resources management program. Natural resources management is not the sum total of projects, interagency coordination or program funding and staffing. Natural resources management at CCAFS, PAFB, MTA and JDMTA is a program and a philosophy that guides the 45 SW's approach to land use. A significant portion of INRMP implementation is done through internal coordination in regard to training site operations and land use decision making. This type of implementation cannot be measured by project implementation or funding levels. It is evidenced by such things as the ability to continually train, sustainable land use, ongoing regulatory compliance, retention of species diversity, retention of surface water quality, and the acknowledgement of sustainable natural resources management by partnering conservation agencies and other interested organizations and individuals.

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In order to monitor and evaluate the effectiveness of the INRMP implementation the following will be reviewed as applicable and discussed within the context of the annual review and/or a formal review of operation and effect:

- Impacts to/from the 45 SW mission;
- Conservation program budget;
- Staff requirements;
- Program and project implementation;
- Trends in species and habitat diversity as evidenced by recurring biological surveys, land use changes, and opinions of natural resource experts;
- Compliance with regulatory requirements; and,
- Feedback from military trainers, the USFWS, NMFS, FWC, and others.

Some of these areas may not be looked at every year due to lack of data or pertinent information. The effectiveness of the INRMP as a mission enabling conservation tool will be decided by mutual agreement of the USFWS, NMFS, FWC and 45 CES/CEIE during annual reviews and/or reviews for operation and effect.

9.3.2.2 USAF and DoD INRMP Implementation Monitoring

The USAF uses the Defense Environmental Programs Annual Report to Congress (DEPARC) to monitor SAIA compliance. DEPARC is the automated system used to collect installation environmental information for reporting to DoD and Congress.

Established to fulfill an annual requirement to report the status of DoD's Environmental Quality (EQ) program to Congress, DEPARC collects information on enforcement actions, inspections and other performance measures for high-level reports and quarterly reviews. DEPARC also helps the USAF track fulfillment of DoD Measures of Merit requirements.

The Deputy under Secretary of Defense (DUSD) *Updated Guidance for Implementation of the SAIA* updated Conservation Metrics for Preparing and Implementing INRMPs. Progress toward meeting these measures of merit is reported in the annual report to Congress. DEPARC reporting requirements currently include answers to these questions:

- The installation plans, programs and budgets for actions that support INRMP goals and objectives?
- Was the INRMP "fully-implemented" during previous execution year?
- Were all funds allocated for INRMP implementation (EQ, Reimbursable, and other) executed for the intended purpose?
- Is there adequate participation/collaboration from USFWS during Annual INRMP Review and major revisions?
- Is there adequate participation/collaboration from the state fish and wildlife agency during Annual INRMP Review and major revisions?

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- Is the INRMP consistent with the goals of the SWAP, CCAs, and other regional ecosystem management agreements for which DoD/USAF is signatory?
- Are communications with USFWS and state fish and wildlife agency documented?
- Does the installation have on-site USAF natural resources management staff employed in the GS-0400 Biological Sciences Job Series?
- Is there a sufficient number of natural resources staff to adequately implement INRMP goals and objectives?
- Are the capabilities of the USAF natural resources team enhanced through use of volunteers, cooperative agreements with non-governmental organizations, on-site contractor support, or Interagency Agreements with other Federal or state agencies?
- Does the installation have adequate conservation law enforcement capability through employment of a credentialed CLEO, or through interagency agreement with another agency?
- Is there adequate participation/collaboration from the Operations Group, Range and Airspace managers, Community Planners, Tenant Organizations and other organizations in INRMP update and revision to ensure mission needs are addressed?
- Does the INRMP support unrestricted use of the installation?
- Has there been a net loss of operations area, airspace, or training lands? Is there a deficiency in capacity, size, or arrangement of the installation natural infrastructure to support the current mission and foreseeable future needs?
- Name the federally listed species present on the installation.
- List the state protected species present on the installation.
- Have surveys for the presence of potentially-occurring, federally-listed species, or suitable habitat within the historic range of a listed species, been conducted on the installation?
- Does the INRMP adequately address potentially-occurring listed species and/or potentially-suitable habitat within the historic range of a listed species?
- Have listed species locations, or potentially-suitable habitats within the historic range of a listed species, been mapped and included as part of the Environmental Functional Data Set and Geodatabase?
- Does the INRMP provide adequate conservation measures for identified listed species and their habitat, as mutually-agreed by USFWS and state fish and wildlife agency during the INRMP Annual Review or major revision coordination?
- Has Critical Habitat for listed species been designated on the installation?
- Have all major ecosystems (i.e., vegetative communities/habitats) been surveyed and mapped for the installation?
- Does the INRMP address the desired future condition for ecosystems, habitats and communities to sustain current and future mission activities and achieve natural resources management goals and objectives?
- Are native habitat restoration projects to support INRMP goals and objectives being planned, programmed, budgeted and executed?

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- Does the INRMP provide for adequate control of invasive and exotic species?
- Does the INRMP address the availability of outdoor recreational opportunities (e.g., hunting, fishing, and other dispersed outdoor recreation) on the installation?
- Does the INRMP address the availability of outdoor recreation opportunities for the public, and establish access and usage categories for installation areas IAW mission and security requirements (i.e., Open, Restricted, Off-Limits)?
- For each outdoor recreation access category (Open, Restricted, Off-Limits), does the INRMP address and justify allowable access to those areas by category of participant (e.g., Active Duty Military, Military Dependents, DoD Civilians, Military Retirees, Defense Contractors, General Public)?
- Does the INRMP address program management for hunting, fishing and other outdoor recreation, and the role of the installation natural resources manager?

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Chapter 10. Annual Work Plans

10.1.1 Work Plans

This chapter summarizes recurring natural resources management activities and programmed projects for CCAFS, PAFB, MTA and JDMTA. Implementation of recurring activities conducted by in-house 45 SW personnel and resources are detailed in **Table 10-1**, while projects (subject to funding availability) are included in **Table 10-2**.

Table 10-1. Recurring Natural Resources Management Activities at CCAFS, PAFB, MTA and JDMTA (1 of 6)

	In-House Management Activity	Objective(s) in Chapter 8	Timing
CCAFS			
1	Meet periodically (in house biologists and contractors) to prioritize scrub LMUs to restore based on previously-prepared LMUs and mission requirements	1.1	Annually
2	Conduct prescribed burning whenever mission requirements allow	1.1	Annually
3	Meet annually to evaluate scrub habitat management techniques / data and determine plan for next FY	1.1	Annually
4	Conduct Florida scrub-jay census	1.1	Annually
5	Distribute 45 SW Instruction on Light Management prior to nesting season and educate base populace via base newspaper and email notifications	1.2	Annually
6	Conduct daily sea turtle monitoring during season for sea turtle index nesting beach survey	1.2	Annually
7	Prepare and submit annual sea turtle nesting summary report	1.2	Annually
8	Conduct light inspections IAW current BO	1.2	Annually
9	Conduct SEBM tracking tube study	1.3	Annually
10	Incorporate SEBM data into GIS for 45 SW	1.3, 5.1	Annually
11	Meet with USFWS to discuss current SEBM trends and permit, and coordinate recommendations for the SEBM	1.3	Annually
12	Implement indigo snake protection plan during construction activities	1.4	As Needed
13	Respond to and relocate non-nuisance alligators, or contact local trapper for nuisance alligators	1.5, 1.8	As Needed
14	Conduct American alligator population surveys as needed	1.5, 1.8	As Needed
15	Identify T&E species of concern not specifically addressed in this document	1.6	As Needed
16	Develop recommendations for other T&E species, if applicable	1.6	As Needed
17	Coordinate with USFWS and FWC or other appropriate agencies, as needed, on any management recommendations for other T&E species	1.6	As Needed
18	Perform annual osprey nesting census	1.6, 2.3	Annually
19	Conduct Florida shorebird nesting surveys/monitoring	1.6, 2.3	Annually
20	Conduct winter shorebird survey	1.6, 2.3	Annually

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Table 10-1. Recurring Natural Resources Management Activities at CCAFS, PAFB, MTA and JDMTA (2 of 6)

	In-House Management Activity	Objective(s) in Chapter 8	Timing
21	Survey project sites for presence of active gopher tortoises as needed	1.7	As Needed
22	Identify recipient sites, tag and record tortoises prior to relocation.	1.7	Annually
23	Incorporate gopher tortoise relocation GIS data into 45 CES GeoBase	1.7, 5.1	2015
24	Trap raccoons, feral hogs and other predators on the beach and inland areas in conjunction with professional trapper services	1.8	Annually
25	Complete steel trap permit report and renewal request	1.8	Biennial
26	Complete annual BO reporting annually and program actions if necessary	1.1-1.3, 1.6	Annually
27	Conduct formal and informal Section 7 consultations	1.1-1.8	As Needed
28	Review projects to ensure no adverse impacts to protected species	1.1-1.8	As Needed
29	Conduct wildlife surveys in support construction projects and other activities that could impact flora and fauna	1.6, 2.1-2.3	As Needed
30	Review fishing rules to determine if revision is required	2.2	Annually
31	Review project actions to determine impacts to fish and their habitat and conduct essential fish habitat consultation as required.	2.2	As Needed
32	Participate in the Bird Hazard Working Group and provide natural resource information as required.	2.3	Annually
33	Perform annual rooftop surveys for least terns and black skimmers	2.3	Annually
34	Complete federal depredation permit report and renewal request	2.3	Annually
35	Conduct annual deer census, as required	2.4	As Needed
36	Respond to injured wildlife	1.1-1.8, 2.1-2.4	As Needed
37	Identify and prioritize areas for invasive plant removal	3.1	As Needed
38	Meet annually to evaluate coastal habitats and identify new projects	4.1	Annually
39	Conduct beach cleanups	4.1	Biannual
40	Review wetlands and impoundments to identify new wetlands and/or projects and prioritize them	4.2, 5.1	Annually
41	Incorporate any new wetland data into GIS for 45 SW	4.2, 5.1	Annually
42	Coordinate and/or conduct a meeting with regulators to discuss / approve any wetland restoration proposals or wetland issues.	4.2	Annually
43	Identify adversely impacted natural resource areas and prioritize / program areas to restore (i.e. abandoned lines of sight, staging areas, etc.)	4.3	Annually
44	Add any adversely impacted natural resource areas into GIS for 45 SW	4.3, 5.1	Annually
45	Conduct assessment of all data collection and storage activities with 45 SW GIS manager and GeoBase POC, and identify/prioritize data to be incorporated and managed	5.1	Annually
46	Use GIS data in applicable NEPA analysis and project planning to identify, delineate and ensure protection of wildlife habitat	1.1-1.7, 2.1-2.3, 5.2	Annually
47	Compile, and maintain, GIS data of the natural vegetative communities, as well as actual and potential habitat for federal and/or state listed species	1.1-1.7, 2.1-2.3, 5.2	Annually

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Table 10-1. Recurring Natural Resources Management Activities at CCAFS, PAFB, MTA and JDMTA (3 of 6)

	In-House Management Activity	Objective(s) in Chapter 8	Timing
48	Conduct Annual NEPA and Natural Resource Training for design engineers and determine other training needs for base personnel and update training materials.	5.2, 6.1	Annually
49	Determine facilities which are non-compliant and notify facility managers	6.1	Annually
50	Maintain training for 45 CES/CEIE-C personnel as needed (i.e. annual burn training, sea turtle workshop, etc.)	6.1	Annually
51	Conduct sea turtle walks for 45 SW leadership and other interested parties	6.2	Annually
52	Participate in events to educate public on natural resource protection and 45 SW activities (i.e. Bird Festival, Boy Scouts, conferences, etc.)	6.2	Annually
53	Investigate how the 45 SW will re-establish and maintain a CLEP (full time 45 SW CES/CEIE-C position lost).	All	2015
PAFB			
1	Review annual sea turtle nesting summary report and contract	1.2	Annually
2	Distribute 45 SW Instruction on Light Management prior to nesting season and educate base populace via base newspaper and email notifications	1.2	Annually
3	Conduct light inspections IAW current BO	1.2	Annually
4	Respond to and relocate non-nuisance alligators, or contact local trapper for nuisance alligators	1.5, 1.8	As Needed
5	Conduct American alligator population surveys as needed	1.5, 1.8	As Needed
6	Identify T&E species of concern not specifically addressed in this document	1.6	As Needed
7	Develop recommendations for other T&E species, if applicable	1.6	As Needed
8	Coordinate with USFWS and FWC or other appropriate agencies, as needed, on any management recommendations for other T&E species	1.6	As Needed
9	Perform annual osprey nesting census	1.6, 2.3	Annually
10	Conduct Florida shorebird nesting surveys/monitoring	1.6, 2.3	Annually
11	Conduct winter shorebird survey	1.6, 2.3	Annually
12	Complete annual BO reporting annually and program actions if necessary	1.2, 1.6	Annually
13	Conduct formal and informal Section 7 consultations	1.1-1.8	As Needed
14	Review projects to ensure no adverse impacts to protected species	1.1-1.8	As Needed
15	Trap raccoons and other predators on the beach and inland areas in conjunction with 45 SW CE Pest Shop	1.8	Annually
16	Identify all reptile/amphibian habitats and incorporate into GIS for 45 SW	2.1	Annually
17	Identify all aquatic habitats and incorporate into GIS for 45 SW	2.2	Annually
18	Review fishing rules to determine if revision is required	2.2	Annually

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Table 10-1. Recurring Natural Resources Management Activities at CCAFS, PAFB, MTA and JDMTA (4 of 6)

	In-House Management Activity	Objective(s) in Chapter 8	Timing
19	Review project actions to determine impacts to fish and their habitat and conduct essential fish habitat consultation as required.	2.2	As Needed
20	Participate in the Bird Hazard Working Group and provide natural resource information as required.	2.3	Annually
21	Perform annual rooftop surveys for least terns and black skimmers	2.3	Annually
22	Complete Federal depredation permit report and renewal request	2.3	Annually
23	Respond to injured wildlife	1.1-1.8, 2.1-2.4	As Needed
24	Identify and prioritize areas for invasive plant removal	3.1	As Needed
25	Meet annually to evaluate coastal habitats and identify new projects	4.1	Annually
26	Conduct beach cleanups	4.1	Biannual
27	Review wetlands and impoundments to identify new wetlands and/or projects and prioritize them	4.2, 5.1	Annually
28	Incorporate any new wetland data into GIS for 45 SW	4.2, 5.1	Annually
29	Coordinate and/or conduct a meeting with regulators to discuss / approve any wetland restoration proposals or wetland issues.	4.2	As Needed
30	Identify adversely impacted natural resource areas and prioritize / program areas to restore (i.e. abandoned lines of sight, staging areas, etc.)	4.3	Annually
31	Add any adversely impacted natural resource areas into GIS for 45 SW	4.3, 5.1	Annually
32	Conduct assessment of all data collection and storage activities with 45 SW GIS manager and GeoBase POC, and identify/prioritize data to be incorporated and managed	5.1	Annually
33	Use GIS data in applicable NEPA analysis and project planning to identify, delineate and ensure protection of wildlife habitat	1.1-1.7, 2.1-2.3, 5.2	Annually
34	Compile, and maintain, GIS data of the natural vegetative communities, as well as actual and potential habitat for federal and/or state listed species	1.1-1.7, 2.1-2.3, 5.2	Annually
35	Conduct Annual NEPA and Natural Resource Training for design engineers and determine other training needs for base personnel and update training materials.	5.2, 6.1	Annually
36	Determine facilities which are non-compliant and notify facility managers	6.1	Annually
37	Maintain training for 45 CES/CEIE-C personnel as needed (i.e. annual burn training, sea turtle workshop, etc.)	6.1	Annually
38	Conduct sea turtle walks for 45 SW leadership and other interested parties	6.2	Annually
39	Participate in events to educate public on natural resource protection and 45 SW activities (i.e. Bird Festival, Boy Scouts, conferences, etc.)	6.2	Annually
40	Investigate how the 45 SW will re-establish and maintain a CLEP (full time 45 SW CES/CEIE-C position lost).	All	2015

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Table 10-1. Recurring Natural Resources Management Activities at CCAFS, PAFB, MTA and JDMTA (5 of 6)

	In-House Management Activity	Objective(s) in Chapter 8	Timing
MTA			
1	Implement indigo snake protection plan during construction activities	1.4	As Needed
2	Conduct formal and informal Section 7 consultations	1.1-1.8	As Needed
3	Review projects to ensure no adverse impacts to protected species	1.1-1.8	As Needed
4	Conduct wildlife surveys in support construction projects and other activities that could impact flora and fauna	1.6, 2.1-2.3	As Needed
5	Identify and prioritize areas for invasive plant removal	3.1	As Needed
6	Review wetlands and impoundments to identify new wetlands and/or projects and prioritize them	4.2, 5.1	Annually
7	Incorporate any new wetland data into GIS for 45 SW	4.2, 5.1	Annually
8	Identify adversely impacted natural resource areas and prioritize / program areas to restore (i.e. abandoned lines of sight, staging areas, etc.)	4.3	Annually
9	Add any adversely impacted natural resource areas into GIS for 45 SW	4.3, 5.1	Annually
10	Conduct assessment of all data collection and storage activities with 45 SW GIS manager and GeoBase POC, and identify/prioritize data to be incorporated and managed	5.1	Annually
11	Use GIS data in applicable NEPA analysis and project planning to identify, delineate and ensure protection of wildlife habitat	1.1-1.7, 2.1-2.3, 5.2	Annually
12	Compile, and maintain, GIS data of the natural vegetative communities, as well as actual and potential habitat for federal and/or state listed species	1.1-1.7, 2.1-2.3, 5.2	Annually
13	Conduct Annual NEPA and Natural Resource Training for design engineers and determine other training needs for base personnel and update training materials.	5.2, 6.1	Annually
14	Maintain training for 45 CES/CEIE-C personnel as needed (i.e. annual burn training, sea turtle workshop, etc.)	6.1	Annually
15	Participate in events to educate public on natural resource protection and 45 SW activities (i.e. Bird Festival, Boy Scouts, conferences, etc.)	6.2	Annually
16	Investigate how the 45 SW will re-establish and maintain a CLEP (full time 45 SW CES/CEIE-C position lost).	All	2015

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Table 10-1. Recurring Natural Resources Management Activities at CCAFS, PAFB, MTA and JDMTA (6 of 6)

	In-House Management Activity	Objective(s) in Chapter 8	Timing
JDMTA			
1	Survey clear zone area to assess mowed and/or disc harrowing (semi-annual) the 30-ft clear zone fenced perimeter per BO to maintain security zone/fire break and possible Scrub	1.1	As Needed
2	At least annually, survey JDMTA for presence of Scrub Jays and obtain JDSP survey data for surrounding habitat	1.1	Annually
3	Implement indigo snake protection plan during construction activities	1.4	As Needed
4	Assess lichen, *Cladonia perforate*, areas and relocation plots and make management recommendations if applicable	1.6	Annually
5	Complete annual BO reporting annually and program actions if necessary	1.1, 1.6	Annually
6	Conduct formal and informal Section 7 consultations	1.1-1.8	As Needed
7	Review projects to ensure no adverse impacts to protected species	1.1-1.8	As Needed
8	Conduct wildlife surveys in support construction projects and other activities that could impact flora and fauna	1.6, 2.1-2.3	As Needed
9	Identify and prioritize areas for invasive plant removal	3.1	As Needed
10	Identify adversely impacted natural resource areas and prioritize / program areas to restore (i.e. abandoned lines of sight, staging areas, etc.)	4.3	Annually
11	Add any adversely impacted natural resource areas into GIS for 45 SW	4.3, 5.1	Annually
12	Conduct assessment of all data collection and storage activities with JDSP , 45 SW and GeoBase POC, and identify/prioritize data to be incorporated and managed	5.1	Annually
13	Correspond regularly via phone/email and through meetings with neighboring JDSP personnel to maintain a successful relationship and data sharing environment	5.1, 5.2	Annually
14	Use GIS data in applicable NEPA analysis and project planning to identify, delineate and ensure protection of wildlife habitat	1.1-1.7, 2.1-2.3, 5.2	Annually
15	Conduct Annual NEPA and Natural Resource Training for design engineers and determine other training needs for base personnel and update training materials.	5.2, 6.1	Annually
16	Compile, and maintain, GIS data of the natural vegetative communities, as well as actual and potential habitat for federal and/or state listed species	1.1-1.7, 2.1-2.3, 5.2	Annually
17	Determine facilities which are non-compliant and notify facility managers	6.1	Annually
18	Maintain training for 45 CES/CEIE-C personnel as needed (i.e. annual burn training, sea turtle workshop, etc.)	6.1	Annually
19	Conduct sea turtle walks for 45 SW leadership and other interested parties	6.2	Annually
20	Participate in events to educate public on natural resource protection and 45 SW activities (i.e. Bird Festival, Boy Scouts, conferences, etc.)	6.2	Annually
21	Investigate how the 45 SW will re-establish and maintain a CLEP (full time 45 SW CES/CEIE-C position lost).	All	2015

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Table 10-2. Projects Identified for CCAFS, PAFB, MTA and JDMTA to Implement the INRMP (Subject to Funding Availability) (page 1 of 8)

Project				Primary Legal Driver	Objective(s) in Chapter 8	FY
Title		Number(s)	Description			
CCAFS						
1	Mgt., Species, FL Scrub-Jay	DBEH157401 DBEH167401 DBEH177401 DBEH187401 DBEH197401	This project will provide funds to conduct monitoring of FL scrub-jays on Cape Canaveral AFS, including: conduct annual census, band birds, survey and mark nests prior to clearing activities, conduct monitoring of birds to determine dispersal after clearing activities, monitor demographic performance of birds, and monitor response of birds from restoration activities. Deliverables will include a monthly report detailing monitoring results including maps showing general territories of birds being monitored; annual census map and GIS data showing locations of jay groups, number of adult and juveniles, identification of bands observed and other general behavior observations; completion of annual permit report for submittal to USFWS; and completion of annual report for the Skid Strip BO.	ESA, BO	1.1	2015 2016 2017 2018 2019
2	Mgt., Habitat REPI Lands	DBEHOS725415 DBEHOS725416 DBEHOS725417 DBEHOS725418 DBEHOS725419	This project will provide funding for the purpose of restoring, enhancing, and maintaining 189 acres scrub habitat on 45 SW conservation easements purchased with funds provided under the DoD REPI program. The easements were obtained for the purpose of preserving habitat for the Florida scrub-jay; they support 1 of 4 recovery criteria "establishment of several scrub preserves with sufficient acreage to sustain viable scrub-jay populations" as stated in the Florida Scrub Jay Recover Plan, dated 9 May 1990. Work would include scrub restoration (large oak removal), invasive plant eradication, creation of bare ground sandy openings, prescribed burning, etc. The County has provided equal matching funds to purchase these properties and are providing additional maintenance funds that exceed the USAF contribution.	ESA, BO	1.1, 3.1	2015 2016 2017 2018 2019
3	Mgt., Wildland Fire	DBEHOS100215 DBEHOS100216 DBEHOS100217 DBEHOS100218 DBEHOS100219	Goods and services required to support implementation of the WFMP. This project will fund an average of four prescribed burns per year averaging 300 acres as required by BO. This work also includes all pre-burn preparation for the planned LMUs to be burned.	ESA, BO	1.1	2015 2016 2017 2018 2019

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Table 10-2. Projects Identified for CCAFS, PAFB, MTA and JDMTA to Implement the INRMP (Subject to Funding Availability) (page 2 of 8)

Project				Primary Legal Driver	Objective(s) in Chapter 8	FY
Title		Number(s)	Description			
4	Mgt., Species, Green Sea Turtle	DBEHOS25615 DBEHOS25616 DBEHOS25617 DBEHOS25618 DBEHOS25619	The purpose of this project will provide funds to perform biannual monitoring of a resident population of juvenile green sea turtles in the Trident Submarine Basin. The monitoring will document the population structure, assess the degree of residency within the basin of individual turtles, estimate the size of the population, assess significant increases or decreases, assess any threats to the population, and provide a final report of all activities and results.	ESA, BO	1.2	2015 2016 2017 2018 2019
5	Mgt., Species, Sea Turtles	DBEH157403 DBEH167403 DBEH177403 DBEH187403 DBEH197403	This project will provide funds to conduct annual monitoring of sea turtles. Scope of work will include the following: perform daily nesting surveys and mark a sample of nests for the three species of sea turtles that nest on CCAFS, monitor nest fates, conduct hatchling productivity of marked nests, screen nests from predators, conduct predator trapping, shield nests from exterior lighting, perform light surveys, perform disorientation surveys, conduct sea turtle stranding and salvage activities, and perform sea turtle educational walks. Deliverables include a spreadsheet detailing daily numbers and locations of all crawls of all species; productivity spreadsheet detailing all fates and all actions taken on all marked nests; monthly report detailing the number of nest and non-nesting emergences, nests lost to predation, nests hatched and nests disoriented; annual sea turtle nesting report to be submitted to FWC; reports for all disorientations observed; reports for all stranded turtles observed; spreadsheet detailing results of all light surveys; annual sea turtle permit renewal package; and an annual disorientation report to be submitted to USFWS per the BO.	ESA, BO	1.2	2015 2016 2017 2018 2019
6	Mgt., Habitat, T&E	DBEHOS100015 DBEHOS100016 DBEHOS100017 DBEHOS100018 DBEHOS100019	The project provides funding to maintain, restore, and enhance 250 acres of scrub habitat on CCAFS. Work includes creating openings, roller chopping, large tree removal, mechanically cutting, and properly disposing of vegetative debris. Scrub habitat restoration also has the benefit of supporting other federally listed and at risk species such as beach mice, indigo snake, and gopher tortoise on CCAFS.	ESA, BO, Species Recovery Plan, CCA	1.1, 1.3-1.4, 1.6-1.7	2015 2016 2017 2018 2019

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Table 10-2. Projects Identified for CCAFS, PAFB, MTA and JDMTA to Implement the INRMP (Subject to Funding Availability) (page 3 of 8)

Project				Primary Legal Driver	Objective(s) in Chapter 8	FY
Title		Number(s)	Description			
7	Mgt., Species, SEBM	DBEHOS25515 DBEHOS25516 DBEHOS25517 DBEHOS25518 DBEH197007	This project will provide funding to conduct an annual tracking tube study in partnership with NASA, NPS, & USFWS to determine the seasonal and annual habitat occupancy of southeastern beach mice within coastal dune/strand habitat on Federal properties, on which the majority of the population is now located. The project will fund a contractor to assist the USAF with setting up 280 tracking tubes on CCAFS, collecting habitat data around each tube, checking tracking tubes over a two week period, analyzing and summarizing the data, and providing a final report of activities and results. Conducting yearly occupancy surveys ensures the USAF has current data during ESA consultations, helps direct project activities to ensure destruction to habitat is avoided, and helps identify declines or increases in population and habitat occupancy from one year to the next.	ESA, BO, Species Recovery Plan	1.3	2015 2016 2017 2018 2019
8	Mgt., Species, Gopher Tortoise	DBEHOS010615 DBEHOS010616 DBEHOS010617 DBEHOS010618 DBEHOS010619	This project will provide the services of a backhoe and operator to assist biologists with the excavation of 50 gopher tortoise burrows to prevent death and/or destruction to gopher tortoises, their burrows and any other state or federally listed species found to inhabit a burrow, in support of various construction projects. In addition, this project includes gopher surveys, bucket trapping, assistance with excavations via backhoe, marking and relocation of tortoises, GIS data collection and management, and completion of the annual Gopher Tortoise CCA report.	CCA	1.7	2015 2016 2017 2018 2019
8	Mgt., Invasive Species, Brazilian Pepper	DBEHOS725215 DBEHOS725216 DBEHOS725217 DBEHOS725218 DBEHOS725219	Project includes the control of invasive species through restoration of 200 acres of scrub habitat utilized by the federally listed Florida scrub-jay, SEBM, eastern indigo snake, and gopher tortoise. Primary invasive species being treated are Brazilian pepper, cogon grass, and Australian pine. Others species include mimosa, castor bean, acacia, giant cane, rosary pea, melaleuca, torpedo grass, natal grass, air potato, lantana, and Russian thistle.	ESA, BOs, CCA, EO 13112	1.1, 1.3, 1.4, 1.6, 1.7, 2.3, 3.1	2015 2016 2017 2018 2019

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Table 10-2. Projects Identified for CCAFS, PAFB, MTA and JDMTA to Implement the INRMP (Subject to Funding Availability) (page 4 of 8)

Project				Primary Legal Driver	Objective(s) in Chapter 8	FY
Title		Number(s)	Description			
9	Mgt., Habitat, Coastal Dune	DBEHOS725115 DBEHOS725116 DBEHOS725117 DBEHOS725118 DBEHOS725119	Funding to restore/enhance 200 acres of coastal dune/strand areas on CCAFS, which may include, but are not limited to, repair/replacement of dune crossovers and fencing, removal of debris from the beach, construction of new dunes, removal/control of invasive species (flora and fauna), and/or planting of native dune vegetation. This project will also include dune construction and planting to avert future storm surge impacts to mission critical facilities and infrastructure and T&E species habitat.	CZMA, ESA, BO	1.2, 1.3, 1.6, 2.2, 2.3, 3.1, 4.1	2015 2016 2017 2018 2019
10	Mgt., Wetlands / Floodplains	DBEHOS100115 DBEHOS100116 DBEHOS100117 DBEHOS100118 DBEHOS100119	This project will support the maintenance, restoration, and enhancement of approximately 375 acres of the 2,800 acres of wetlands on CCAFS. The funds are needed for invasive plant treatments, restoration of hydrology and planting of native wetland plant species where invasive plants are removed.	CWA, EO 13112	3.1, 4.2	2015 2016 2017 2018 2019
11	Monitor, Wetlands	DBEH157404 DBEH167404 DBEH177404 DBEH187404 DBEH197404	Restored wetlands will be monitored IAW regulatory permit requirements and provide annual reports. Monitoring of 76 acres of restored wetlands will include invasive exotic plants, not to exceed 5% cover; appropriate wetlands species, at least 80% of cover; and water quality to be equal to or greater than the baseline analysis. Permit requires 5 years of monitoring after completion of project and acceptance by regulatory agencies	CWA	2.2, 2.3, 3.1, 4.2	2015 2016 2017 2018 2019
12	Equipment, CN Activities	DBEHOS72415 DBEHOS72416 DBEHOS72417 DBEHOS72418 DBEHOS72419	Includes funding for the purchase, lease, maintenance, and repairs of equipment required in support of natural & cultural resource activities prescribed in the INRMP and ICRMP (i.e., cameras, memory cards, GPS units, telescopes, binoculars, botanical sampling equipment, chainsaws, handheld brush cutter, 5 ATVs, 2 UTVs, ATV trailers, ATV bush hog, etc.)	ESA, BOs, CCA, SAIA	1.1-4.3	2015 2016 2017 2018 2019
13	Supplies, CN	DBEHOS72515 DBEHOS72516 DBEHOS72517 DBEHOS72518 DBEH197008	Includes funding for expendable supplies, not equipment, unique to conservation (e.g., snake/safety boots, gloves, catch poles, helmets, face shields, sun screen, insect repellant, head gear, etc.) and program specific supplies. Sea turtle program: stakes, nest screens, stranding kit supplies, bait and traps for sea turtle hatchling predator control, sea turtle nest screening material to reduce light disorientation. Scrub jay program: banding materials, cages, bait, flagging, light brush clearing tools, etc. Gopher tortoise program: shovels, buckets, containers, towels.	ESA, BOs, CCA, SAIA	1.1-4.3	2015 2016 2017 2018 2019

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Table 10-2. Projects Identified for CCAFS, PAFB, MTA and JDMTA to Implement the INRMP (Subject to Funding Availability) (page 5 of 8)

Project				Primary Legal Driver	Objective(s) in Chapter 8	FY
Title		Number(s)	Description			
15	Herptile/ Indigo Snake Survey	TBD	TBD	ESA	1.4, 1.5,1.6, 2.1	TBD
16	Gopher Tortoise Survey	TBD	TBD	CCA	1.6, 1.7	TBD
PAFB						
1	Construct Back Dune	SXHT087255	This project will create a 'back dune' (behind the primary dune) in two areas totaling approximately 1 mile in length utilizing sand from an approved upland source. Dune will be designed to follow FEMA templates, and dune vegetation will be planted along new dune to aid in naturally blocking artificial light to prevent disorientations of federally protected sea turtles.	ESA, BOs, CZMA	1.2, 1.3, 1.6, 2.2, 2.3, 3.1, 4.1	2020
2	Mgt., Species, Sea Turtles	SXHTOS100315 SXHTOS100316 SXHTOS100317 SXHTOS100318 SXHTOS100319	This project will conduct an annual survey of the PAFB population of sea turtles. This project will survey and track nesting and hatching success along PAFB beach (4.3 miles) in compliance with BOs issued by USFWS to assess potential impacts from 45 SW lighting and dune/beach restoration efforts (dune restoration FY13/14).The three species of sea turtles this project covers are the loggerhead, green and leatherback. Surveys are performed daily from 1 May to 30 September; they include a count of crawls per species per day and monitoring for predation, hatch success and disorientation. Data is used to assist the USFWS is determining population trends and recovery effort success. Monitoring for disorientation is required by a USFWS BO, which establishes an incidental take of 3% or less due to disorientation caused by 45SW lighting. Daily monitoring for disorientation is essential to identify problem light sources immediately to prevent take exceedance.	ESA, BOs	1.2	2015 2016 2017 2018 2019

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Table 10-2. Projects Identified for CCAFS, PAFB, MTA and JDMTA to Implement the INRMP (Subject to Funding Availability) (page 6 of 8)

Project				Primary Legal Driver	Objective(s) in Chapter 8	FY
Title		Number(s)	Description			
3	Mgt., Habitat, Coastal Dune	SXHTOS673815 SXHTOS673816 SXHTOS673817 SXHTOS673818 SXHTOS673819	Project will include approximately 5 acres of dune restoration efforts. Approximately 500 sea grapes will be planted, the invasive Chaste tree will be mechanically removed, and herbicide will be applied by hand on re-sprouting chaste tree within previously planted sea grape areas. This project is needed to implement BO light management initiatives for T&E sea turtles.	ESA, BOs, EO 13112	1.2, 1.6, 2.2, 2.3, 3.1, 4.1	2015 2016 2017 2018 2019
4	Mgt., Habitat, Coastal Upland	SXHT127002 SXHT127003 SXHT127004	This multi-phase project is to continue to restore and monitor 25 acres of the closed Landfill site #5 (ERP site) which was dominated by Brazilian pepper. Restoration is to include 1,000 cubic yards (cy) of top soil, over 140 plants/trees from 1-gallon (gal) to 15-gal, 900 cy of mulch, and herbicide treatment of re-sprouts of Brazilian pepper, Australian pine, chaste tree (*Vitex*), cogon grass, natal grass, and *Wedelia*. Under this restoration plan, T&E habitat protection and biodiversity education will be implemented. Phasing is required due to cost, landfill constraints, re-treatment of invasive species, and habitat restoration using native plants and educational ecosystem trail/signs. This project protects/enhances T&E habitat, specifically for the wood stork and FL manatee shoreline habitat and the gopher tortoise. The project will end in FY 2017.	ESA, CCA	1.6, 1.7, 2.2, 2.3, 3.1, 4.1	2015 2016 2017
5	Mgt., Invasive Species, Brazilian Pepper	SXHTOS673715 SXHTOS673716 SXHTOS673717 SXHTOS673718 SXHTOS673719	This project will include mechanical and manual removal of previously untreated invasive species, monitoring prior invasive removal within approximately 30 acres to determine the effectiveness of treatment, and re-treatment of new saplings/sprouting of invasive, exotic vegetation (e.g., Brazilian pepper, Chaste tree, *Wedelia*, cogon grass, Australian pine, etc.) that adversely competes with desirable native species at PAFB. The primary method of control will be hand removal with follow-up herbicide application using portable herbicide spraying equipment. The project will also protect wood stork habitat (shoreline/wetland restoration) and gopher tortoise (and their habitat) IAW the ESA and the Candidate Conservation Agreement, respectively.	ESA, CCA, EO 13112	1.3, 1.6, 1.7, 2.1-2.3, 3.1, 4.1-4.3	2015 2016 2017 2018 2019

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Table 10-2. Projects Identified for CCAFS, PAFB, MTA and JDMTA to Implement the INRMP (Subject to Funding Availability) (page 7 of 8)

Project				Primary Legal Driver	Objective(s) in Chapter 8	FY
Title		Number(s)	Description			
6	Supplies, CN	SXHTOS100415 SXHTOS100416 SXHTOS100417 SXHTOS100418 SXHTOS100419	Includes expendable supplies to provide required conservation safety equipment (e.g., safety boots, gloves, catch poles, helmets, face shields, sun screen, insect repellant, head gear, etc.) and sea turtle program supplies (e.g., stakes, nest screens, stranding kit supplies, bait and traps for sea turtle hatchling predator control, sea turtle nest screening material to reduce light disorientation).	ESA, BOs, CCA, SAIA	1.1-4.3	2015 2016 2017 2018 2019
MTA						
1	Mgt., Habitat, Flatwoods	NYRL167401 NYRL177401 NYRL187401 NYRL197401	Project involves the restoration of approximately 25 acres of flatwoods habitat in the west sector of MTA that is used for 45 SW training and asset storage. Flatwoods habitat is utilized by the gopher tortoise. The federally threatened indigo snake may also be present in this location. The FFS and Palm Bay Fire Department assessed MTA as having high fuel load at present. Restoration activities will include clearing/thinning overgrown habitat to reduce fuel loads and wildfire risk and the treatment of invasive species.	ESA, CCA, EO 13112	1.4,.6, 1.7, 2.1, 3.1	2016 2017 2018 2019
2	Mgt., Invasive Species, Brazilian Pepper	NYRLOS673715 NYRLOS673716 NYRLOS673717 NYRLOS673718 NYRLOS673719	This project will include mechanical and manual removal of previously untreated invasive species, monitoring prior invasive removal within approximately 130 acres to determine the effectiveness of treatment, and re-treatment of new saplings/sprouting of invasive, exotic vegetation (e.g., Brazilian pepper, cogon grass, climbing fern, natal grass, rosary pea, lantana, Australian pine, java plum, guava, rattlebox, Melaleuca, etc.) that adversely competes with desirable native species at MTA. The primary method of control will be mechanical removal with follow-up herbicide application using portable herbicide spraying equipment. The project will also the protect gopher tortoise (and their habitat) IAW the Candidate Conservation Agreement.	CCA, SAIA, EO 13112	3.1	2015 2016 2017 2018 2019

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Table 10-2. Projects Identified for CCAFS, PAFB, MTA and JDMTA to Implement the INRMP (Subject to Funding Availability) (page 8 of 8)

Project				Primary Legal Driver	Objective(s) in Chapter 8	FY
Title		Number(s)	Description			
JDMTA						
1	Mgt., Invasive Species, Brazilian Pepper	JJAEOS673715 JJAEOS673716 JJAEOS673717 JJAEOS673718 JJAEOS673719	This project will include monitoring prior invasive species removal within the JDMTA property (approximately 15 acres including clear zone) to determine the effectiveness of treatment, and re-treatment of new saplings/sprouting of invasive, exotic vegetation (e.g., earleaf acacia, rosary pea, natal grass, and schefflera) that adversely competes with desirable native species. The primary method of control will be mechanical removal with follow-up herbicide application using portable herbicide spraying equipment. The project will also the protect gopher tortoise (and their habitat) IAW the CCA.	CCA, SAIA, EO 13112	3.1	2015 2016 2017 2018 2019

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Chapter 11. Acronyms and Abbreviations List

45 CES/CEIE-C	45 SW Civil Engineer Squadron Environmental Conservation Element
45 CES/CENP	45 SW Portfolio Optimization Element
45 CES/CEV	45th Civil Engineer Squadron Environmental Flight
45 FSS	45 SW Force Support Squadron
45 SW	45th Space Wing
45 SW/XPR	45 SW Plans and Program Requirements Office
45 SW/CC	45 SW Commander
45 SW/PA	45 SW Public Affairs Office
45 SW/SEF	45 SW Flight Safety Office
45 SW/SJA	45 SW Staff Judge Advocate
ACHP	Advisory Council on Historic Places
AFCEC	US Air Force Civil Engineer Center
AFI	Air Force Instruction
AFPD	Air Force Policy Directive
AFRC	Air Force Reserve Command
AFSPC	Air Force Space Command
AFTAC	Air Force Technical Applications Center
AHB	Africanized honey bees
AICUZ	Air Installation Compatible Use Zone
AIRFA	American Indian Religious Freedom Act
APHIS	Animal and Plant Health Inspection Service
ARPA	Archaeological Resources Protection Act
ASSRT	Atlantic Sturgeon Status Review Team
ATV	All Terrain Vehicle
BA	Biological Assessments
BASH	Bird Aircraft Strike Hazard
BCI	Bat Conservation International
BDA	blast danger area
BFE	Base Flood Elevations
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practices
BO	Biological Opinion
C	Celsius
CBRA	Coastal Barrier Resources Act
CBRS	Coastal Barrier Resources System
CCA	Candidate Conservation Agreement
CCAFS	Cape Canaveral Air Force Station
CE	Civil Engineer
CEC	Commission for Environmental Cooperation
CECOS	Civil Engineer Corps Officers School
CEQ	Council on Environmental Quality
CES	Civil Engineering Squadron
CFR	Code of Federal Regulations
CLEO	Conservation Law Enforcement Officer
CLEP	Conservation Law Enforcement Program

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CPA	Canaveral Port Authority
CPI	Consumer Price Index
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
DEOMI	Defense Equal Opportunity Management Institute
DEPARC	Defense Environmental Programs Annual Report to Congress
DoD	Department of Defense
DoDI	Department of Defense Instruction
DRMO	Defense Reutilization and Marketing Office
DUSD	Deputy under Secretary of Defense
EA	Environmental Assessment
EEL	Environmentally Endangered Lands
EEZ	exclusive economic zone
EFH	Essential Fish Habitat
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EMS	Environmental Management System
EO	Executive Order
EOD	Explosive Ordnance Disposal
EQ	Environmental Quality
ER	Eastern Range
ERP	Environmental Restoration Program or Environmental Resource Permit
ESA	Endangered Species Act
ESC	Environmental Support Contract(or)
ESMC	Eastern Space and Missile Center
ESOH	Environmental, Safety and Occupational Health
ESOHCAMP	Environmental, Safety and Occupational Health Compliance Assessment and Management Program
F	Fahrenheit
FAMCamp	Family Camping
FCMP	Florida Coastal Management Program
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FDHR	Florida Division of Historical Resources
FDMA	Florida Department of Military Affairs
FEMA	Federal Emergency Management Agency
FFS	Florida Forest Service
FHHA	Florida Hog Hunters Association
FIRM	Flood Insurance Rate Maps
FL	Florida
FLEPPC	Florida Exotic Pest Plant Council
FLETC	Federal Law Enforcement Training Center
FLIR	Forward Looking Infrared
FLUCFCS	Florida Land Use, Cover and Forms Classification System
FMC	Fishery Management Council
FMP	Fishery Management Plan

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FNAI	Florida Natural Areas Inventory
FOCC	Flight Operations Control Center
FONPA	Finding of No Practical Alternative
FONSI	Finding of No Significant Impact
FS	Florida Statutes
FWC	Florida Fish and Wildlife Conservation Commission
FWRA	Florida Water Resources Act
FY	fiscal year
GIS	geographic information system
GTCCA	Gopher Tortoise Candidate Conservation Agreement
HAPC	Habitat Areas of Particular Concern
HMS	Highly Migratory Species
HPS	high pressure sodium
HUC	Hydrologic Unit Code
IAW	in accordance with
ICRMP	Integrated Cultural Resources Management Plan
IFAS	Institute of Food and Agricultural Sciences
IICEP	Interagency/ Intergovernmental Coordination for Environmental Planning
INRMP	Integrated Natural Resources Management Plan
IPM	Integrated Pest Management
IPMP	Integrated Pest Management Plan
IRL	Indian River Lagoon
IRLNEP	Indian River Lagoon National Estuary Program
IRP	Installation Restoration Program
ISEERB	Interservice Environmental Education Review Board
ISO	International Standards Organization
JD	Jurisdictional Determination
JDMTA	Jonathan Dickinson Missile Tracking Annex
JDSP	Jonathan Dickinson State Park
JSTARS	Joint Stars Joint Test Force
KSC	Kennedy Space Center
LED	light emitting diode
LMA	launch danger area
LMP	Light Management Plans
LMU	Land Management Unit
LPS	low pressure sodium
MAFMC	Mid-Atlantic Fishery Management Council
MBTA	Migratory Bird Treaty Act
mg/L	milligrams per liter
MHW	mean high water mark
MINWR	Merritt Island National Wildlife Refuge
MMPA	Marine Mammal Protection Act
MOA	Memoranda of Agreement

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MOU	Memoranda of Understanding
mph	miles per hour
MS4	municipal separate storm sewer systems
MSDS	Material Safety Data Sheet
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MOC	Morrell Operations Center
MSGP	Multi Sector General Stormwater Permit
msl	mean sea level
MTA	Malabar Transmitter Annex
NAGPRA	Native American Graves Protection and Repatriation Act
NASA	National Aeronautics and Space Administration
NATHPO	National Association of Tribal Historic Preservation Officers
NEPA	National Environmental Policy Act
NFWF	National Fish and Wildlife Foundation
NGA-ERNST	National Geospatial Intelligence Agency
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOTU	Naval Ordnance Test Unit
NPDES	National Pollutant Discharge Elimination Systems
NPS	National Park Service
NRDC	Natural Resources Defense Council
NRO	National Reconnaissance Office
NWI	National Wetlands Inventory
NWP	Nationwide Permits
ONRW	Outstanding National Resource Waters
OPlan	Operations Plan
OPR	Office of Primary Responsibility
ORMP	Outdoor Recreation Management Plan
OSHA	Occupational Safety and Health Administration
PAFB	Patrick Air Force Base
PARC	Partners in Amphibian and Reptile Conservation
PBO	Programmatic Biological Opinion
PIF	Partners in Flight
PLS	Planning Level Survey
POC	Point of Contact
ppt	parts per thousand
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
REPI	Readiness and Environmental Protection Initiative
ROD	Record of Decision
ROMA	Regional Offsite Mitigation Area
RV	Recreational Vehicle
SAFMC	South Atlantic Fishery Management Council

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SAIA	Sikes Act Improvement Act
SCLS	Space Coast Launch Services
SCUBA	Self-Contained Underwater Breathing Apparatus
SEBM	Southeastern Beach Mouse
SEF	Aircraft Flight Safety Office
SERCC	Southeast Regional Climate Center
SFWMD	South Florida Water Management District
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Officer
SJRWMD	St. Johns River Water Management District
SLC	Space Launch Complex
SMZ	stream management zones
SOP	Standard Operating Procedure
SPCC	Spill Prevention Control Countermeasures
SPGP	State Programmatic General Permit
SR	State Road
SRM	solid rocket motor
SVS	Services Squadron
SWAP	Florida State Wildlife Action Plan
SWI	Space Wing Instruction
SWPPP	Storm Water Pollution Prevention Plan
T&E	Threatened and Endangered
TBD	to be decided
TDS	total dissolved solids
TGC	triploid grass carp
TMDL	total maximum daily loads
UCF	University of Central Florida
UF	University of Florida
URTD	Upper Respiratory Tract Disease
USACE	US Army Corps of Engineers
USAF	US Air Force
USC	US Code
USCG	US Coast Guard
USDA	United States Department of Agriculture
USEPA	US Environmental Protection Agency
USFS	US Forest Service
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
VIB	Vertical Integration Building
VIF	Vertical Integration Facility
WAP	Wildlife Action Plan
WFMP	Wildland Fire Management Plan
WQC	Water Quality Certification
WWTF	Wastewater Treatment Facility

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