FINAL

Integrated Natural Resources Management Plan Update for Homestead Air Reserve Base, Homestead, Florida

Prepared for

Homestead Air Reserve Base

July 2015

CH2MHILL®

6600 Peachtree Dunwoody Rd
Suite 600
Atlanta, Georgia 30328

Table of Contents

Appendixes

Tables

Figures

Acronyms and Abbreviations

AAF	Army Air Field
ACC	Air Combat Command
AFBCA	Air Force Base Conversion Agency
AFCEC	Air Force Civil Engineer Center
AFCEC/CI	AFCEC Installations Directorate
AFCEE	Air Force Center for Environmental Excellence
AFI	Air Force Instruction
AFPD	Air Force Policy Directive
AFRC	Air Force Reserve Command
AGE	Aerospace Ground Equipment
AICUZ	Air Installation Compatible Use Zone
ARB	Air Force Base
AST	aboveground storage tank
ATSDR	Agency for Toxic Substances and Disease Registry
BASH	bird/wildlife aircraft strike hazard
BCE	Base Civil Engineer
BMP	best management practice
BNP	Biscayne National Park
BRAC	Base Realignment and Closure
CDMP	Comprehensive Development Master Plan
CERCLA	Comprehensive Environmental Restoration, Compensation, and Liability Act
CEV	Chief-Environmental Flight
CFR	Code of Federal Regulations
cm	centimeter
CO	carbon monoxide
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
°F	degrees Fahrenheit
DERM	Division of Environmental Resource Management
DO	dissolved oxygen
DoD	Department of Defense

DODI	Department of Defense Instruction
DRMO	Defense Reutilization and Marketing Office
ECISMA	Everglades Cooperative Invasive Species Management Area
EIAP	Environmental Impact Analysis Process
EIS	environmental impact statement
EMS	Environmental Management System
EO	executive order
ESA	Endangered Species Act
ESCZ	explosive safety clear zone
ESOHC	Environment, Safety, and Occupational Health Councils
F.A.C.	Florida Administrative Code
FAA	Federal Aviation Administration
FANG	Florida Air National Guard
FCMP	Florida Coastal Management Program
FDEP	Florida Department of Environmental Protection
FDNR	Florida Department of Natural Resources
FEMA	Federal Emergency Management Agency
FFWCC	Florida Fish and Wildlife Conservation Commission
FIG	Fighter Interceptor Group
FNAI	Florida Natural Areas Inventory
FONPA	Finding of No Practicable Alternative
FTE	Full time equivalent
FW	Fighter Wing
GIS	Geographic Information System
HARB	Homestead Air Reserve Base
HQ AFRC	Headquarters Air Force Reserve Center
ICRMP	Integrated Cultural Resources Management Plan
IESMP	Invasive and Exotic Species Management Plan
INRMP	Integrated Natural Resources Management Plan
IPMP	Integrated Pest Management Plan
IRP	Installation Restoration Program
IST	Installation Support Team
ISWMP	Integrated Solid Waste Management Plan

JP	Jet Propulsion
km^2	square kilometer
m	meter
MBTA	Migratory Bird Treaty Act
mi^2	square mile
mm	millimeter
MMRP	Military Munitions Response Program
MSGP	Multi-Sector General Permit
msl	mean sea level
MWR	Morale, Welfare, and Recreation
NGVD	National Geodetic Vertical Datum
NO_X	nitrogen oxides
NPL	National Priorities List
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NWCG	National Wildfire Coordinating Group
OU	operable unit
PM	particulate matter
$PM_{2.5}$	particulate matter less than 2.5 microns in aerodynamic diameter
PM_{10}	particulate matter less than 10 microns in aerodynamic diameter
POL	petroleum, oils, and lubricants
PPMP	Protected Plant Management Plan
ROD	Record of Decision
SAC	Strategic Air Command
SAIA	Sikes Act Improvement Act
SEIS	supplemental EIS
SFWMD	South Florida Water Management District
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
SOCSOUTH	United States Army Special Operations Command South
SOUTHCOM	United States Southern Command
SOW	Statement of Work
SROD	supplemental record of decision

SSC	species of special concern
SWMM	Surface Water Management Model
SWPPP	Stormwater Pollution Prevention Plan
T&E	threatened and endangered
TAC	Tactical Air Command
TFW	Tactical Fighter Wing
U.S.C.	United States Code
UDB	urban development boundary
UEA	urban expansion area
USACE	U.S. Army Corps of Engineers
USAF	United States Air Force
USCBP	United States Customs and Border Protection Service
USDA	U.S. Department of Agriculture
USDA-APHIS	U.S. Department of Agriculture Animal and Plant Health Inspection Service
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WASD	Water and Sewer Department
WFMP	Wildfire Management Plan
WFPM	Wildland Fire Program Manager

Chapter 1 Executive Summary

The primary purpose of this Integrated Natural Resources Management Plan (INRMP) is to integrate the management and conservation of natural resources with the military mission and land use needs of Homestead Air Reserve Base (HARB, the base), Homestead, Florida. The United States Air Force Reserve Command (AFRC) has prepared this INRMP for HARB. This INRMP has been developed to meet the statutory regulations of the Sikes Act Improvement Act (SAIA) of 1997, the 2004 Air Force Instruction (AFI) 32-7064, "Integrated Natural Resource Management," and Air Force Policy Directive (AFPD) 32-70, "Environmental Quality." In cooperation with its federal and state partners, the United States Fish and Wildlife Service (USFWS), the Florida Fish and Wildlife Conservation Commission (FFWCC), and the National Park Service (NPS), and incorporating public input, HARB will endeavor to conserve, protect, and manage fish and wildlife resources on the base.

This INRMP identifies goals, objectives, and strategies for the management of HARB's natural resources for the next 5-year period. Management practices and projects have been identified to support the strategies and accomplish the goals and objectives of this INRMP. The recommended management practices and projects take into consideration and are consistent with the military mission requirement for the use of land within the boundaries of HARB. HARB's land area is used for the military mission, a majority of which includes uses for explosive safety clear zone (ESCZ) arcs, runway primary and transitional surface zones, administrative and industrial support facilities, and airfield drainage; therefore, management practices and projects in the INRMP largely focus on ways to enhance the natural environment consistent with mission requirements, including airfield drainage, maintaining safety clearance zones, wetland management practices and initiatives, and grounds maintenance practices. This INRMP provides a discussion of environmental stewardship initiatives for the remaining natural communities, as well as efforts to control both invasive and exotic animal and plant species. HARB will explore measures to reduce the prevalence of invasive species on HARB while preventing conditions that would contribute to a bird/wildlife aircraft strike hazard (BASH) potential.

The goals, objectives, strategies, recommended management practices, and projects of this INRMP have been determined by the HARB Environmental Flight (CEV) and Headquarters United States Air Force Reserve Command (HQ AFRC) to:

- Result in no net loss of HARB's capability to support its military mission
- Be in compliance with the SAIA of 1997, AFI 32-7064, and AFPD 32-70
- Be consistent with other plans, programs, and initiatives at HARB
- Integrate natural resources management activities with HARB's mission

Chapter 2 General Information

2.1 Purpose and Scope

Purpose: The primary purpose of this INRMP is to integrate the management and conservation of natural resources with HARB's military mission and land use needs. This INRMP will serve as a guide for all natural resources and land use management actions on HARB over the next 5 years. The plan will serve as a tool for integrating natural resources and land management actions on HARB with other government and non-government agency actions and plans, and as the basis for funding natural resource management projects (see Sections 5.5.1 and 7.12, Appendix A).

Scope: This INRMP will serve as the guide for all natural resources and land management planning and operations, including updates to management processes, plans, and programs for HARB over the next 5 years per AFI 32-7064. The plan provides a comprehensive overview of HARB's natural resources, as well as goals and objectives for resources management that are consistent with the military mission. HARB will use the INRMP to reinforce measures for compliance with applicable laws, executive orders (EOs), regulations, directives, and instructions, as well as to identify and provide direction for stewardship initiatives that are not necessarily required by law or regulations but that are considered best management practices (BMPs).

2.2 Management Philosophy

Ecosystem management is the guiding philosophy for the development of this INRMP and it was prepared in consideration of United States Air Force (USAF) principles for ecosystem management outlined in AFI 32-7064. An interdisciplinary team approach was used in the plan's preparation. Coupled with stakeholder involvement, an interdisciplinary approach ensures that management opportunities for the human-made and natural environments are addressed and integrated into a set of goals and objectives that, when implemented collectively, achieve the overall aim of ecosystem management. The interagency team for this INRMP included the USFWS, FFWCC, and NPS. See related correspondence in Appendix B.

Information used in the preparation of this INRMP was gathered from various military and non-military sources, field surveys and investigations, and previously prepared plans and programs for HARB. Military sources include the Air Force Center for Environmental Excellence (AFCEE), now known as the Air Force Civil Engineer Center (AFCEC), the AFRC, the AFCEC Installations Directorate (AFCEC/CI; formerly the Air Force Real Property Agency [AFRPA]), and HARB personnel. Non-military resources contacted during the development process included various local government departments, federal and state government agencies, and regional authorities, as well as non-government conservation organizations (see Chapter 6). These sources and others assisted with the data collection efforts and analyses throughout the development of this document.

The INRMP's goals, objectives, recommended management actions, and projects have been reviewed for, and determined to be consistent with, the military mission of HARB. The INRMP was developed in consideration of the *General Plan Homestead Air Reserve Base* (HARB, 2011) and supports the objectives of the Bird/Wildlife Aircraft Strike Hazard (BASH) Reduction Plan (USAF, 2011; Appendix C), Integrated Pest Management Plan (IPMP) (AFRC, 2013: Appendix D), and the Air Installation Compatible Use Zone (AICUZ) study (HARB, 2007).

2.3 Authority

The legal authority for natural resources management programs on AFRC lands is the Sikes Act of 1960. The Sikes Act promotes the effective planning, development, maintenance, and coordination of wildlife, fish, and game conservation and rehabilitation on military reservations. In November 1997, the Sikes Act was amended by the Sikes Act Improvement Act (SAIA). The SAIA requires the secretaries of military departments to prepare and implement INRMPs for each military installation in the United States that has significant natural resources.

The AFRC has prepared this INRMP for HARB to comply with the SAIA. This INRMP also complies with the following United States Department of Defense (DoD) and USAF instructions and directives:

- Department of Defense Instruction (DODI) 4715.03 "Natural Resources Conservation Program"
- Air Force Instruction (AFI) 32-7064 "*Integrated Natural Resources Management*" (September 17, 2004);
- Title 32 Code of Federal Regulations (CFR), Part 989, "*Environmental Impact Analysis Process* (*EIAP)*"
- AFPD 32-70 "Environmental Quality"
- Department of Defense Manual 4715.03, Integrated Natural Resources Management Plan (INRMP) Implementation Manual

2.4 Integration with Other Plans

HARB operates under a variety of plans and programs to maintain the operational integrity of its military mission. Plans and programs have been prepared in accordance with AFIs and USAF directives and are compliant with federal and state requirements. The plans and programs address aspects of both the human-made environment (e.g., facilities associated with operations) and the natural environment, and have a direct impact on natural resources and land management decisions within HARB. This INRMP is designed to recognize, integrate, and support the future development of existing plans and programs. Plans include those listed in Section 2.2 in addition to the HARBI 13-401 Air Field Operations (HARB, 2006a), the Stormwater Pollution Prevention Plan (SWPPP) (HARB, 2012), and the Hazardous Waste Management Plan (AFRC, 2013).

Chapter 3 Installation Overview

3.1 Location and Area

HARB consists of approximately 1,943 acres and is within Miami-Dade County, Florida, approximately 25 miles southwest of the city of Miami, approximately 2 miles west of Biscayne National Park (BNP), and 10 miles east of Everglades National Park (see Figure 3-1). Nearby incorporated areas include the communities of Homestead and Florida City located west and southwest of HARB, respectively. Land use in the immediate vicinity of HARB is a mixture of commercial, residential, and agricultural parcels.

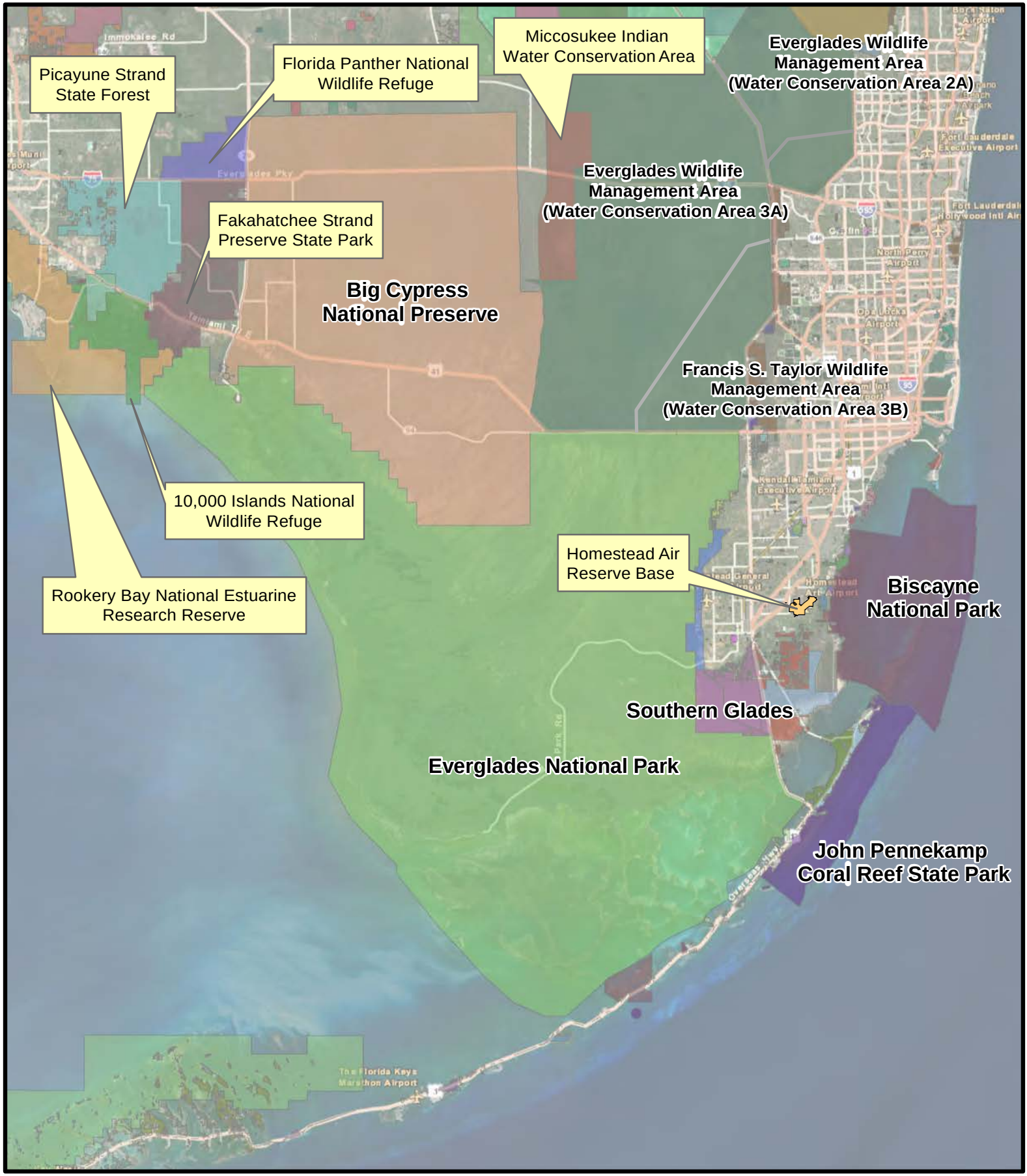
HARB contains approximately 700 personnel, about half military and half civilian, while an additional 200 to 300 reservists are at the base for training; not all are full-time employees. No residential population exists on the base, and there is no public access.

3.2 Installation History

The present-day HARB is situated on property that Pan American Air Ferries, Inc. originally operated as a commercial airfield. The property was deeded to the federal government after the United States entered World War II. Homestead Army Air Field (AAF) was activated in September 1942 when the Caribbean Wing Headquarters of the United States Army obtained control of the property. Homestead AAF served as a staging facility for the Army Transport Command, which was responsible for maintaining and dispatching aircraft to overseas locations. Homestead AAF remained in operation until September 1945, when a severe hurricane caused extensive damage to most of the airfield's facilities. Because of the high costs of rebuilding, coupled with the anticipated post-wartime reductions in military operations, the facility was placed on inactive status, at which time the Dade County Port Authority took possession of the property and released it to Dade County (now known as Miami-Dade County) for management. The port authority retained possession for the next 8 years. During this period, crop dusters used the runways, and the buildings housed a few small industrial and commercial operations (HARB, 2009a).

In 1953, the federal government again acquired the facility and rebuilt it as a Strategic Air Command (SAC) base. The first operational squadron arrived in 1955, and Homestead AAF was redesignated Homestead Air Force Base (AFB). In 1960, the facility was modified to accommodate B-52 aircraft. In 1962, the 31st Tactical Fighter Wing (TFW) moved from George AFB, California, to Homestead AFB in response to growing concerns regarding Cuba's actions. Once the revolution ended in 1959, Cuba adopted a communist political system under the regime of Fidel Castro and formed diplomatic relations with the Soviet Union. The U.S. ended diplomatic relations with the Cuban government in early 1961. In October 1962, the Cuban Missile Crisis occurred, resulting in the recognized need for an operational tactical USAF presence in south Florida. On July 1, 1968, the command of the facility was changed from SAC to Tactical Air Command (TAC), and the 31st TFW became the host unit, flying F-4 aircraft. In 1984, the 31st TFW converted to F-16 aircraft. In 1992, TAC transitioned into the Air Combat Command (ACC) (HARB, 2009a).

In 1992, Hurricane Andrew struck south Florida and caused extensive damage to Homestead AFB, which occupied approximately 2,938 acres at that time (see Figure 3-2). As a result, in 1993, Homestead AFB was placed on the Base Realignment and Closure (BRAC) list and slated for realignment with a reduced mission. The USAF determined that approximately 1,632 acres of



Legend

Homestead Air Reserve Base

0 3.25 6.5 13 Miles

Figure 3-1
Location Map
Integrated Natural Resources Management Plan
Homestead Air Reserve Base, Florida

Source: Florida Natural Areas Inventory, 2013

Homestead AFB were excess to its needs and surplus to the needs of the federal government, so later that year the AFBCA began operating from the base to manage the disposal of the land declared excess and surplus. Homestead AFB was listed on the National Priorities List (NPL) because of contamination to soil, groundwater, and surface waters. The AFBCA mission included the Comprehensive Environmental Restoration, Compensation, and Liability Act (CERCLA) remediation of sites at the base that were contaminated by petroleum products and derivatives (AFBCA, 2002). The AFBCA (later known as the AFCEC/CI) mission also included assistance to the local community for determining property reuse and conveyance.

In January 1994, the USAF issued a final environmental impact statement (EIS) on the disposal of Homestead AFB, and in April 1994, Homestead AFB officially was closed (AFBCA, 2002). The USAF decided to make over 1,800 acres of surplus property available to Miami-Dade County for use as a public airport. The AFRC planned to use the remainder of the property and designated it the Homestead Air Reserve Station (U. S. Air Force and Federal Aviation Administration [USAF and FAA], 2001).

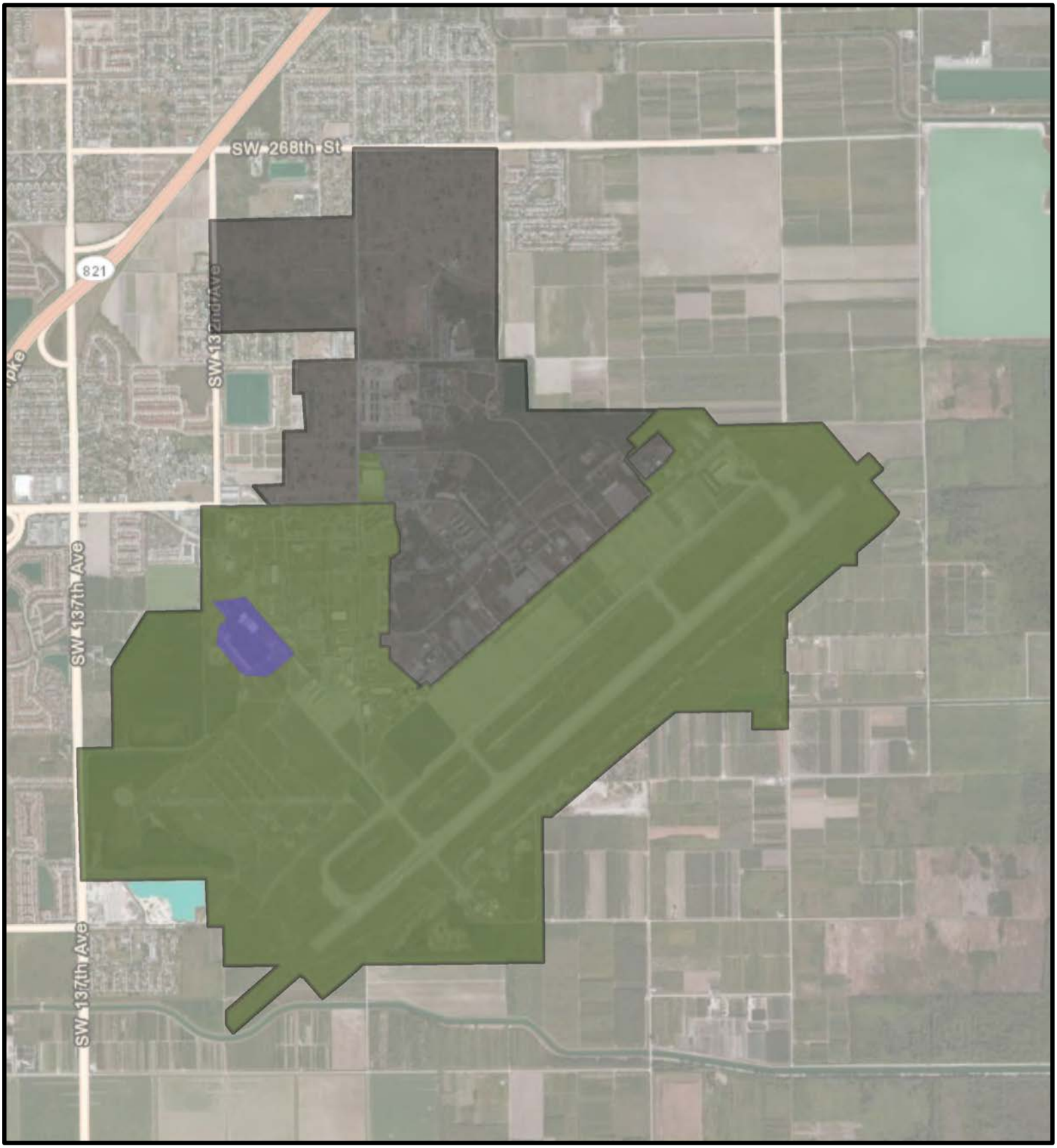
In December 1997, the USAF and the FAA determined that the potential development of a commercial airport at the former Homestead AFB warranted further review and study, and began preparation of a supplemental EIS (SEIS). A draft SEIS was published for public review and comment in December 1999, and in December 2000, the final SEIS for the disposal of portions of the former Homestead AFB was prepared (USAF and FAA, 2001). On January 15, 2001, a supplemental record of decision (SROD) was issued to supplement both the record of decision (ROD) dated October 26, 1994, and the SROD dated February 20, 1998. According to the SROD, the USAF would transfer the remaining surplus property (717 acres) to Miami-Dade County for mixed-used development. The USAF would retain about 915 acres, including the airfield (USAF and FAA, 2001).

As a result of the SROD, the USAF approved (in 2002) Miami-Dade County's mixed-use redevelopment, non-aviation land redevelopment plan, and application for Economic Development Conveyance on 614 acres (AFBCA, 2002). An additional 26 acres was given to the United States Department of Education for transfer via a Public Benefit Conveyance to Miami-Dade County Public Schools (AFBCA, 2002). The 482nd Fighter Wing (FW) assumed ownership of approximately 1,091 additional acres of land, including the airfield, runway, airfield apron, control tower, and Boundary Canal System in 2003. Management of the Outfall Canal (also known as Military Canal) was also transferred to the 482nd FW after the AFCEC/CI completed CERCLA remedial actions (AFBCA, 2002).

Approximately 1,943 acres of former Homestead AFB property have been retained for use by the 482nd FW and its tenant commands, including the airfield (see Figure 3-2). Surplus former Homestead AFB property totals approximately 1,000 acres, which have been conveyed or leased to a variety of outside entities (AFBCA, 2002).

3.3 Current Military Missions

The 482nd FW's mission is to train and equip reservists to respond to wartime and peacetime taskings as directed by higher headquarters. The FW specifically trains for mobility, deployment, and employment.



Legend

- Homestead Air Reserve Base
- USCBP
- Former Homestead Air Force Base

N

0 500 1,000 2,000 Feet

Figure 3-2
Comparision Between the Former Homestead AFB and Homestead ARB
Integrated Natural Resources Management Plan
Homestead Air Reserve Base, Florida

The 482nd FW maintains and operates HARB and is a fully combat-ready unit capable of providing F-16C multi-purpose fighter aircraft, along with mission-ready pilots and support personnel, for short-notice worldwide deployment. The 482nd FW includes the following groups:

482nd Operations Group

- 482nd Operations Support Flight
- 93rd Fighter Squadron
- 70th Aerial Port Squadron

482nd Support Group

- 482nd Mission Support Squadron
- 482nd Communications Squadron
- 482nd Services Flight
- 482nd Civil Engineer Squadron
- 482nd Security Forces Squadron

482nd Logistics Group

- 482nd Maintenance Squadron
- 482nd Logistics Support Squadron
- 482nd Medical Squadron

The 93rd Fighter Squadron ("Makos") flies and maintains the F-16C Fighting Falcon aircraft. This squadron's F-16s can be identified by the letters "FM" ("Florida Miami") and by the mako sharks displayed on the tail section. The 482nd FW also supports and trains civil engineering, communication, medical, logistics, aircraft maintenance, mission support, aerial port, and security police squadrons, which can be used interchangeably with active-duty units to meet USAF responsibilities around the world. The 482nd FW has a high operations tempo, engaging in year-round training to ensure that the 482nd FW remains combat-ready and worldwide deployable. With its unique geographic location, the 482nd FW regularly hosts combat units from around the world. Visiting units come to south Florida to take advantage of the superb flying weather and the training airspace, as well as facilities equipped with state-of-the-art air combat maneuvering instrumentation.

As the host unit at HARB, the 482nd FW supports the operations of several tenant units and partner commands, including the "scramble" capability of a detachment of Florida Air National Guard (FANG) F-15 fighter interceptors in addition to the U.S. Customs and Border Protection Services -Miami Aviation Branch drug enforcement air interdiction mission. During the Atlantic hurricane season, the 482nd FW routinely supports forward deployment of the Air Force Reserve's "Hurricane Hunters" weather reconnaissance mission. HARB tenant and partner commands and their missions are:

- **Florida Air National Guard.** Detachment 1 of the 125th Fighter Interceptor Group (FIG) is responsible for supporting the Southeast Air Division Sector with armed interceptor aircraft on continuous alert status. Central to the unit's mission are escort, identification, and shadowing activities. When directed, the unit is responsible for the destruction of aircraft posing a clear and immediate danger to the United States and its property.
- **United States Army Special Operations Command South (SOCSOUTH).** This unit is a subordinate unit of the United States Southern Command (SOUTHCOM). It is a joint

Theater Special Operations Command that plans and conducts special operations in support of the combatant commander's strategies, plans, and operations.

- **United States Customs and Border Protection Service (USCBP).** The mission of the USCBP's Miami Aviation Branch is intercepting, tracking, and apprehending suspect air and marine drug smugglers in the direct interdiction of smuggling operations and national security issues within the eastern United States.
- **Defense Reutilization and Marketing Offices (DRMOs)** DRMOs receive and temporarily store excess federal government supplies at Building 164, the Base Recycling Center. The Defense Reutilization and Marketing Service, which manages the DRMOs, is responsible for the sale, redistribution, donation, or disposal of excess and obsolete federal government supplies.

3.4 Surrounding Communities

The regional community of HARB is defined by the city of Miami to the north, the Homestead-Florida City areas to the west and southwest, BNP to the east, and Everglades National Park to the west.

Land uses adjacent to HARB are principally low- to high-density residential, agriculture, and vacant land (see Figure 3-3). To the east and south of HARB, land use activity is primarily agriculture with some newly constructed high- and medium-density residential units. The majority of the agricultural land located near HARB is used for commercial nurseries. Beyond the agricultural land located east and south of HARB are large tracts of vacant land. Some agricultural land abuts HARB along the northwest side, but the majority of land north of HARB is unimproved or developed property associated with the former Homestead AFB (see Section 3.2).

Most urban development occurs to the north and west of HARB and is within the Miami-Dade County urban development boundary (UDB). The UDB, as defined in the 2015 to 2025 Miami-Dade Comprehensive Development Master Plan (CDMP), includes portions of the county where urban development is acceptable. Generally, the UDB aligns with the U.S. 1 and State Highway 821 (Florida Turnpike) corridor, and incorporates the city of Homestead, as well as Florida City, and HARB (see Figure 3-3). The urban expansion area (UEA), as defined in the CDMP, delineates the area where development may be warranted within the next 10 to 20 years. The UEA encompasses property immediately north, northeast (outside the area designated for disposal under BRAC) of HARB (see Figure 3-3). Over the next 10 to 20 years, most growth in south Miami-Dade County is expected to occur within the UDB and the UEA boundaries.

The eastern boundary of the city limits of Homestead abuts the western boundary of the base along Speedway Boulevard (see Figure 3-3). Historically, the city of Homestead has been the center of Miami-Dade County's agricultural industry and provides cultural, business, and economic opportunities for the area. The city is surrounded by unincorporated Miami-Dade County to the north, west, and east, and Florida City to the south (USAF and FAA, 2000; see Figure 3-3). The population of Homestead increased from 26,866 in 1990 to 31,909 in 2000 (U.S. Census Bureau [USCB], 1990 and 2013a). According to the 2010 U.S. Census, the population of Homestead is 60,512, which is an increase of 53 percent from the 2000 population (USCB, 2013b).

Florida City is approximately 5 miles southwest of HARB (see Figure 3-3). Over the last 30 years, the population of Florida City has experienced both growth and decline. Between 1980

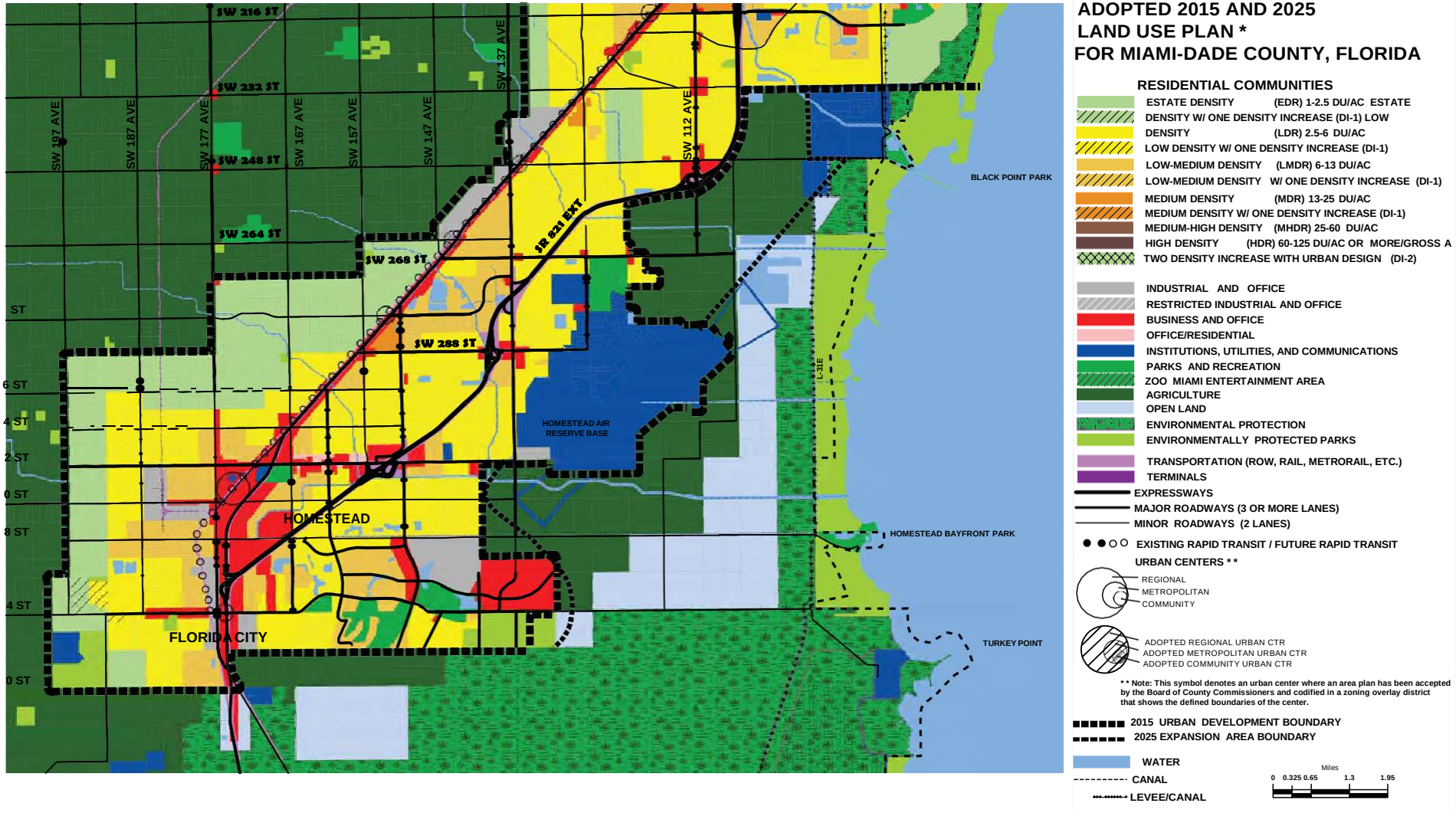


Figure 3-3
2012-2025 Land Use Map
Integrated Natural Resources Management Plan
Homestead Air Reserve Base, Florida

Source: DRER, 2013

and 1990 the city's population decreased 3.2 percent. Between 1990 and 2010, the population increased by 93 percent to 11,245 (USCB, 1990 and 2013b).

3.5 Local and Regional Natural Areas

Several federal and state parks and preserves occur within the vicinity of HARB. BNP is approximately 2 miles east, Everglades National Park is approximately 10 miles west, and Big Cypress National Preserve is approximately 30 miles northwest of HARB. The Everglades and Francis S. Taylor Management Area is also approximately 20 miles northwest of HARB. The John Pennekamp Coral Reef State Park is immediately south of BNP, approximately 13 miles southeast of HARB. The Rookery Bay National Estuarine Research Reserve, the 10,000 Islands National Wildlife Refuge, the Florida Panther National Wildlife Refuge, the Picayune Strand State Forest, and the Fakahatchee Strand Preserve State Park are along the western coast of the south Florida peninsula and are within driving distance of HARB.

Chapter 4 Physical Environment

This section describes the existing physical environment on HARB and within the geographic region of HARB. The information presented in this section will establish a baseline for monitoring how successfully the goals and objectives presented in Chapter 8 are implemented.

HARB does not contain any coastal habitats. Coastal communities within 2 miles of the base include the mangrove swamps along the shoreline of Biscayne Bay, salt marshes, seagrass beds in nearshore waters, and open marine waters in Biscayne Bay. In addition, the coral reefs of the Florida Keys are nearby to the south,

Due to the particular geography of Florida, and for purposes associated with the federal Coastal Zone Management Act (CZMA) of 1972, the entire state has been determined to be within the coastal zone and subject to oversight by the state's federally approved Florida Coastal Management Program (FCMP). HARB is, therefore, located within Florida's designated coastal zone. Under provisions of the CZMA, any federal activity that has the potential to impact Florida's coastal resources is reviewed for consistency with the 24 Florida statutes comprising the legislative framework of the FCMP, which is implemented by the Florida Department of Environmental Protection (FDEP) (FDEP, 2012). HARB ensures compliance with the FCMP through the Environment, Safety, and Occupational Health Councils (ESOHC) and 32 CFR 989, "Environmental Impact Analysis Process."

4.1 Climate

HARB is within a subtropical maritime climate characterized by long, warm, rainy summers and mild, dry winters. Temperatures in the region are warm, but are moderated by the maritime influences of the Atlantic Ocean and Gulf of Mexico. The average high temperature for HARB is 81.3 degrees Fahrenheit (°F) while the average low temperature is 68.2°F.

In general, only two seasons characterize the local weather: a summer wet season from May through October, and a winter dry season from November through April. Rainfall averages about 8 inches per month during the rainy season and about 2 inches per month during the dry season, with a total average rainfall of 63.3 inches per year.

Typically, the area receives sea breezes of 6 to 8 knots from the east and southeast, but wind direction varies depending on the season. Between December and February, the prevailing winds are from the northwest; between March and August, the winds are primarily from the southeast; and between September and November, the prevailing winds are easterly (USAF and FAA, 2000).

Tornadoes are very rare within this region, but can occur. Severe lightning storms also may occur during the summer. Hurricanes impact the region approximately every 3 years during hurricane season (between June and October; HARB, 2009a). In September 1945, a severe hurricane caused extensive damage to the airfield, placing the base on inactive status until 1953. In August 1992, Hurricane Andrew struck the Homestead/Miami area, causing the most property damage in United States history at the time. The hurricane caused severe damage to 97 percent of the former Homestead AFB (Agency for Toxic Substances and Disease Registry [ATSDR], 1998).

4.2 Landforms

The land surface at HARB is relatively flat, with elevations ranging from approximately 5 to 10 feet above mean sea level (msl) (AFCEE, 2001). The following geomorphic or physiographic features are present in the southeastern peninsula of Florida: the Everglades Trough, the Atlantic Coastal Ridge (Miami Ridge), and the Southern Slope (Figure 4-1). HARB is within the Atlantic Coastal Ridge physiographic province (see Figure 4-1) (White, 1970).

The Atlantic Coastal Ridge extends south from the Jacksonville vicinity along Florida's east coast. The southern extension of the Atlantic Coastal Ridge is called the Miami Ridge, which is underlain by very porous oolitic limestone that was formed under warm, shallow marine waters during higher sea levels of the Pleistocene era about 2 million years ago (Natural Resources Conservation Service [NRCS], 1996). The Miami Ridge is relatively narrow and sandy, bounded by coastal marshes and mangrove swamps to the south and east and the Everglades to the west, and forms the highest ground elevations (up to 10 feet) in southeastern Miami-Dade County (HARB, 2009a).

4.3 Geology and Soils

4.3.1 Geology

In the Homestead area, the Miami Oolite consists of soft, cream or tan oolitic limestone, interbedded with sandy limestone and thin layers of hard limestone. The thickness of the Miami Oolite ranges from about 20 to 30 feet at the base (Figure 4-2; AFCEE, 2001).

The Miami Oolite is underlain by the Fort Thompson formation, which consists of a series of alternating shallow, marine, brackish marine, and freshwater limestone. In the Homestead area, the Fort Thompson formation consists of approximately 50 feet of white and tan to gray calcareous sandstone and sandy limestone with some quartz sand (Figure 4-2; AFCEE, 2001). Both the Miami Oolite and Fort Thompson formation are highly permeable and are the principal components of the Biscayne aquifer in the area (Fish and Stewart, 1991).

The Tamiami formation, Pliocene to late Miocene in age, underlies the Fort Thompson formation in the Homestead area. The Tamiami formation is approximately 130 feet thick in the HARB area (Figure 4-2; AFCEE, 2001). The Tamiami formation consists of limestone, clayey and calcareous marl locally hardened to limestone, silty and shelly sand, and shell marl (Causaras, 1987). The upper portion of the Tamiami formation is permeable limestone that, in places, grades into loosely to well-cemented sandstone, shelly sand, and silt.

Locally, the upper Tamiami formation is permeable limestone. The lower part of the Tamiami formation is composed primarily of very coarse to fine grained shelly sand and sandstone. The sand and sandstone grades vertically and interfingers with shelly, silty calcareous sand, siltstone, and claystone (Causaras, 1987). In the Homestead area, the lower Tamiami formation is green and gray sandy and silty marl with some clay and compact limestone. The lower part of the Tamiami formation is moderately porous to virtually nonporous and, in conjunction with similar low-permeability sediments of the underlying Hawthorn Group, forms a confining unit between the Biscayne aquifer and the underlying Floridan aquifer.

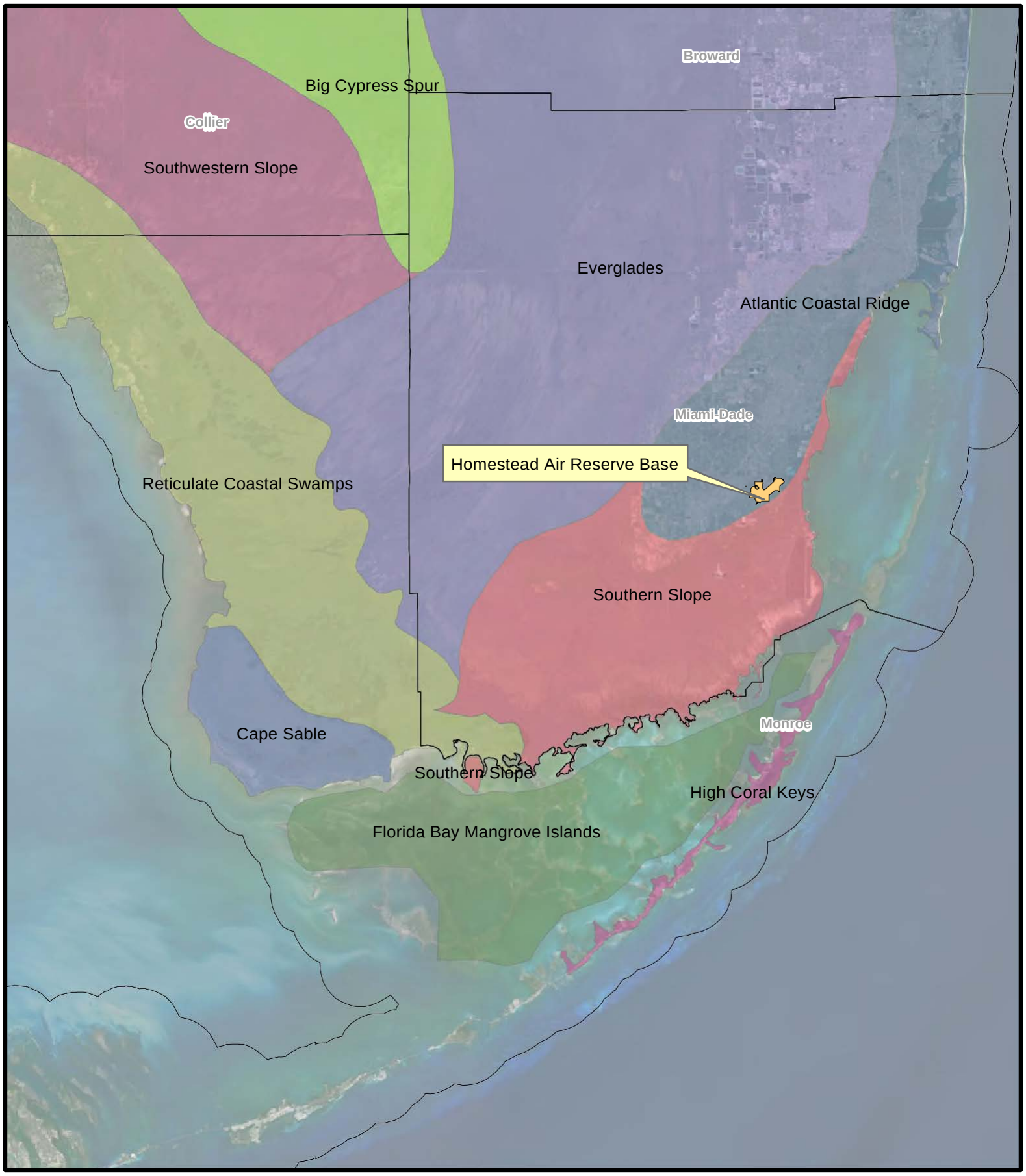


Figure 4-1
The Geologic and Physiographic Features
of the Southeastern Peninsula of Florida
Integrated Natural Resources Management Plan
Homestead Air Reserve Base, Florida

Source:Florida Geological Survey, 1998

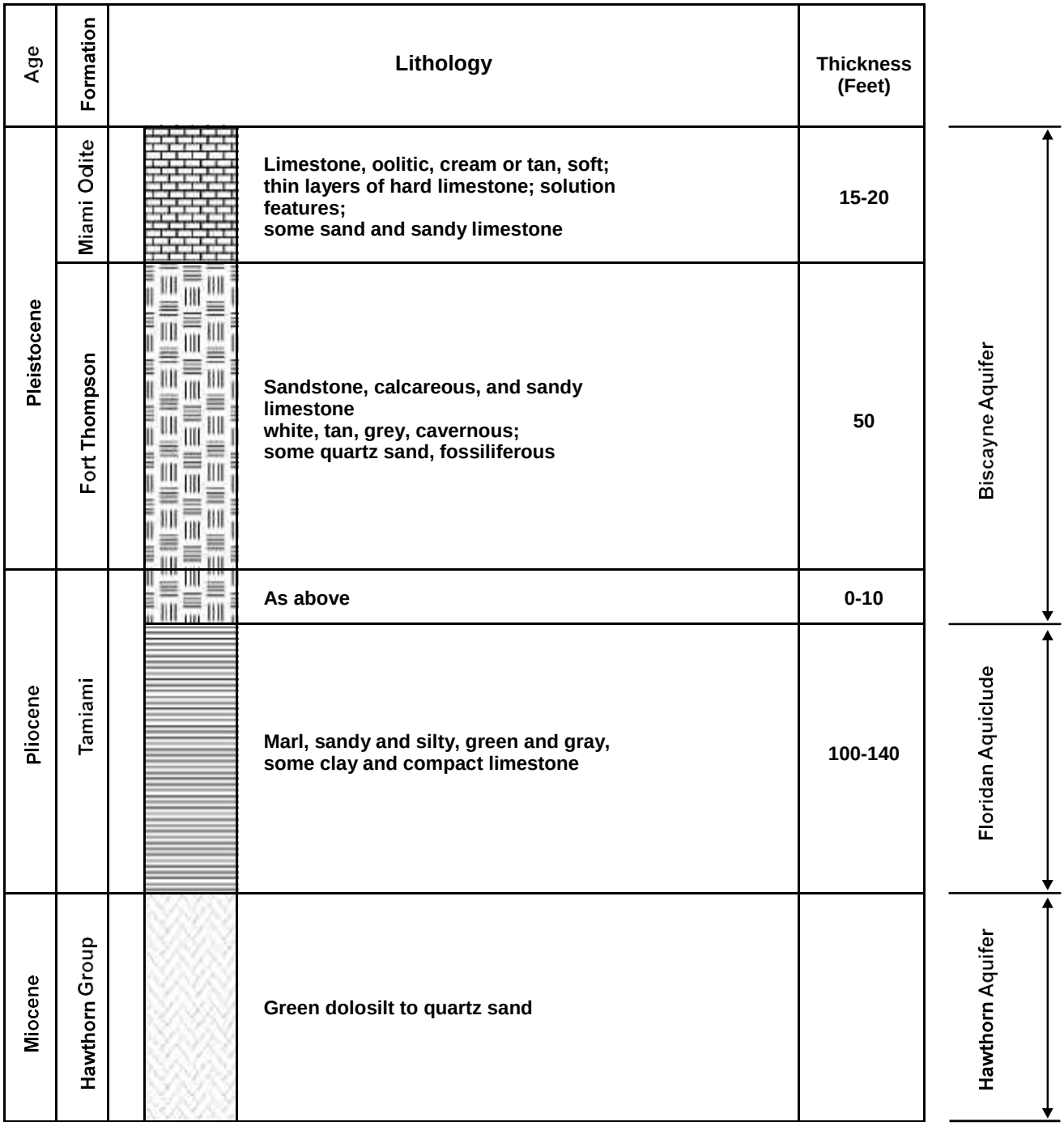


Figure 4-2
Homestead Area Generalized Stratigraphic Column
Integrated Natural Resources Management Plan
Homestead Air Reserve Base, Florida

Source: NRCS, 1996

4.3.2 Soils

There are six different soil map units within HARB. Table 4-1 summarizes the important characteristics and the coverages of soil types on HARB (NRCS, 1996). Figure 4-3 indicates the general locations of the soil units on the base. In general, approximately 74 percent of HARB land consists of Urban Land/Udorthents-Urban Land Complex soil types (see Table 4-1). Udorthents are nearly level areas of extremely stony fill material that are almost always used for urban or recreational development, and are limited in their ecological potential. Limitations for this soil unit include wetness and the presence of underlying organic material. These limitations may be overcome by the use of stable fill material and the addition of, in some cases, extensive drainage systems (NRCS, 1996).

4.4 Hydrology

4.4.1 Surface Water Hydrology

Natural drainage on HARB is generally poor due to the relatively flat surface and the location of the water table, which is either at or near the land surface of HARB. Stormwater runoff is collected in an internal drainage system of canals, swales, ditches, and pipes, most of which eventually discharge into the Boundary Canal.

The Boundary Canal system consists of the Boundary Canal, the Flightline Canal, several associated drainage canals/ditches, and the stormwater reservoir. The Boundary Canal surrounds HARB property (AFCEE, 2001; Figure 4-4). A levee that runs along the outer bank of the Boundary Canal prevents runoff originating outside the base from entering the property except for a small portion at the northernmost end of the base at a point along SW 288th Street (AFCEE, 2001). The Boundary Canal is divided into two major segments (Figure 4-4):

- The **west-south (W-S)** Boundary Canal segment begins in the northwestern corner of HARB at Biscayne Drive (SW 288th Street). The segment flows along the west and south perimeters of the base and leads to the stormwater reservoir at its western edge. The total length of the W-S segment is approximately 25,000 feet (4.9 miles; AFCEE, 2001).
- The **north-east (N-E)** Boundary Canal segment begins at the north end of the former Homestead AFB south of the former golf course at SW 280th Street (Walden Drive). It flows east past Mystic Lake and along the north and east perimeters of the former base. The N-E segment leads to the stormwater reservoir at the northeast corner of the former base. The total length of the southeast segment is reported to be approximately 15,400 feet (2.9 miles; AFCEE, 2001).

The stormwater reservoir is on the eastern side of the base and receives flow from the W-S and N-E segments of the Boundary Canal system (Figure 4-4). The reservoir is approximately 300 feet wide and 900 feet long (AFCEE, 2001). Typical depths are estimated to range between 10 and 20 feet. Assuming an average depth of 12 feet, the reservoir volume is estimated to be 46.3-acre feet (AFCEE, 2001).

A control structure is at the eastern edge of the reservoir, which discharges water into the culvert between the reservoir and Military Canal (AFCEE, 2001). This control structure is only opened when extra water needs to be discharged. During periods of heavy rainfall, three 100,000-gallon manual pumps with a total combined maximum rate of 300,000 gallons per minute (668 cubic feet per second) (AFCEE, 2001) pump water to the Military Canal. These pumps were designed

TABLE 4-1
Soil Map Units, Descriptions, and Coverage
HARB Integrated Natural Resources Management Plan

Soil Map Unit	Description	Depth to Apparent High water Table (feet)	Building Site Suitability	Percentage of Land Surface
(10) Udorthents, limestone substratum – Urban land complex	Moderate/not hydric includes nearly level areas consisting of lawns, vacant lots, parks, and playgrounds	NA	NA	7
(13) Biscayne Marl	Very shallow, nearly level and poorly drained on broad low areas	Typically, the water table in Biscayne Marl soil is within 10 inches of the surface, but could recede down to 20 inches during drought	Severe This soil is severely limited for development due to the high water table and depth to the bedrock	12
(15) Urban Land	NA/not hydric includes streets, buildings, or other structures where the soil is covered and cannot be identified	NA	NA	31
(16) Biscayne marl, drained	Very shallow, nearly level and poorly drained on low areas	Typically, the water table in Biscayne Marl soil is within 10 inches of the surface, but could recede down to 20 inches during drought	Severe This soil is severely limited for development due to the high water table and depth to the bedrock	10
(20) Cardsound silty clay loam – rock outcrop complex	Calcareous, loamy mixture, very shallow, well drained, and moderately slowly permeable underlain with limestone bedrock	5-6	Severe Due to depth to the bedrock and small stones, these soil types are severely limited for development; however, local construction methods can generally overcome these limitations	2
(42) Udorthents, limestone substratum, 0 to 5% slopes	Rapid/not hydric	NA	NA	36
NA	Water	NA	NA	2
Total	NA	NA	NA	100

Source: NRCS, 1996 and HARB, 2009a

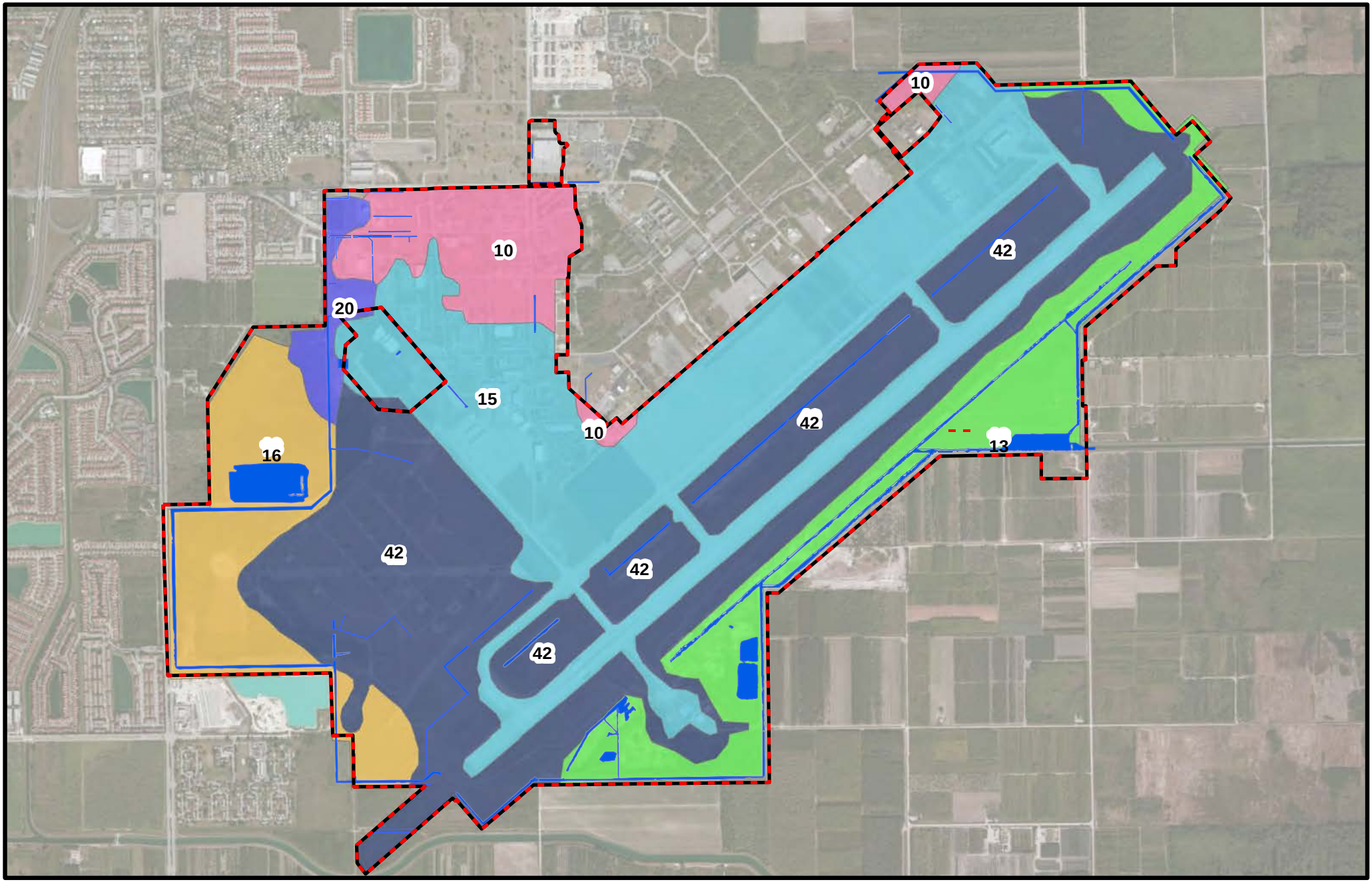


Figure 4-3
Soil Types
Integrated Natural Resources Management Plan
Homestead Air Reserve Base, Florida

Source: NRCS, 1996

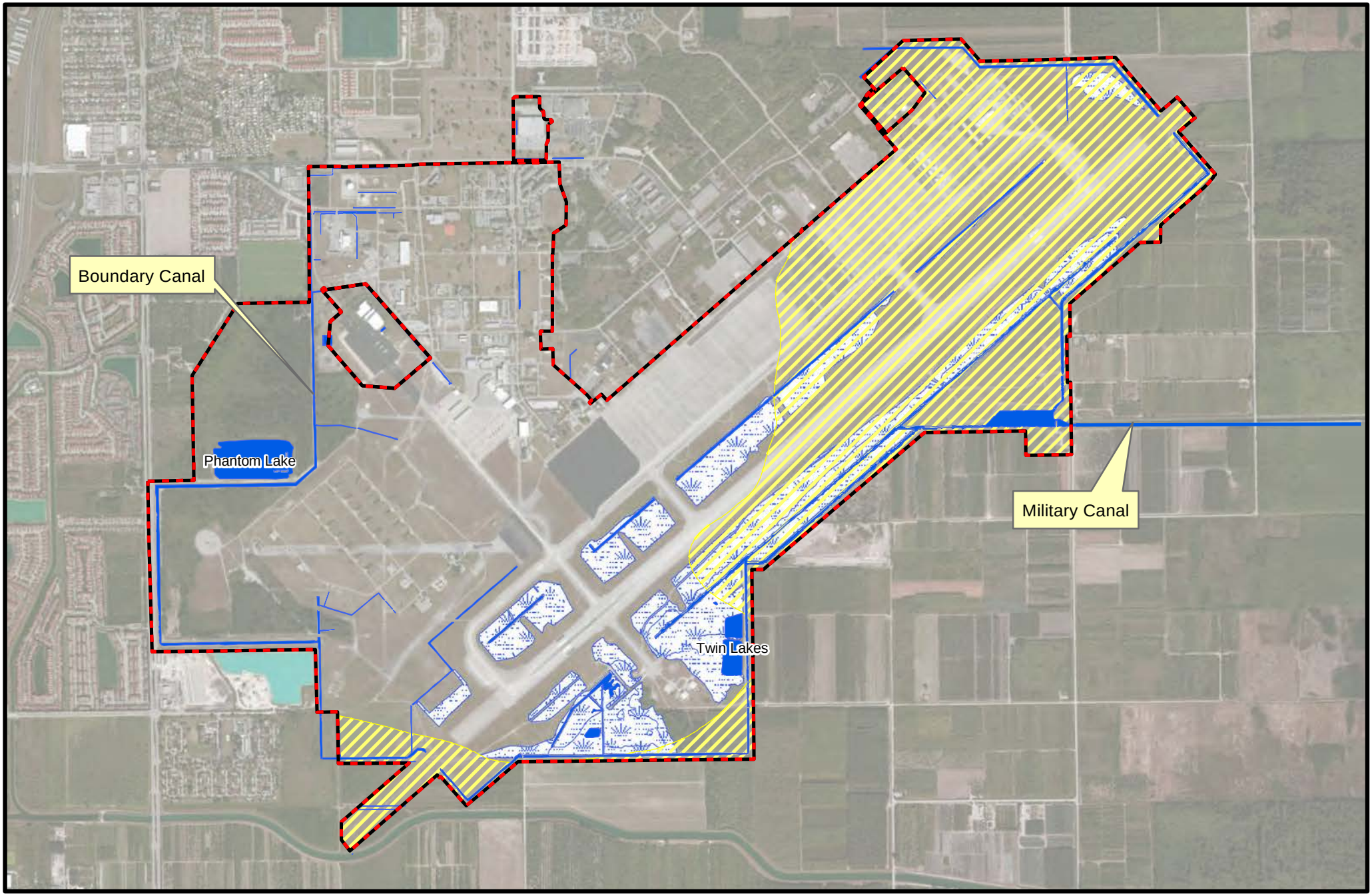


Figure 4-4
Surface Waters Features, Wetlands, and Flood Areas
Integrated Natural Resources Management Plan
Homestead Air Reserve Base, Florida

to begin pumping at an elevation of 3.0 feet National Geodetic Vertical Datum (NGVD) and shut down at an elevation of 2.5 feet NGVD (AFCEE, 2001). As a result, water elevations in the Flightline Canal are at acceptable operational levels and the pumps continue to operate until the water level in the canal is lowered to 2.5 feet NGVD. Manatee exclusion grates were also installed at the control structure at the eastern edge of the reservoir.

Military Canal is immediately east of the pump house and stormwater reservoir (see Figure 4-4). The primary purpose of Military Canal is to remove runoff from HARB. The U.S. government owns the drainage easements for Military Canal. Military Canal is one in a series of canals that serve as part of a complex water management system to control flooding, reduce saltwater intrusion, maintain water flow into Biscayne Bay, and provide recharge for municipal wellfields. The canal is approximately 11,400 feet long with an average width of 40 feet (AFCEE, 2001). A saltwater control structure (S-20G) is along Military Canal approximately 1.4 miles east of the reservoir (AFCEE, 2001). According to the South Florida Water Management District (SFWMD), this structure controls the flow of Military Canal to minimize saltwater intrusion from Biscayne Bay. The majority of the flow from Military Canal into Biscayne Bay is from HARB; however, agricultural lands, commercial nurseries, and other unused areas between HARB and Biscayne Bay also contribute to runoff into the bay (USAF and FAA, 2000). The estimated average annual discharge from Military Canal to Biscayne Bay, using the Surface Water Management Model (SWMM) results, is 4,560 acre-feet (USAF and FAA, 2000). This represents about 1.1 percent of the total freshwater input to southern Biscayne Bay (USAF and FAA, 2000). The Military Canal between HARB and Biscayne Bay receives groundwater influx from the surrounding agriculture lands.

Previous water quality monitoring studies performed on the reservoir/canal system indicate that runoff discharging from HARB is of excellent water quality and generally meets Florida Class III surface water quality standards (AFCEE, 2001). Of the 3,960 water quality tests performed on the Military Canal from 1989 to 1998, exceedances of Class III standards have been limited to 111 instances of dissolved oxygen (DO), 233 of specific conductance, and 3 of total coliform (AFCEE, 2001). These exceedances are normal and are not indicative of a water quality problem (AFCEE, 2001). Low DO is typical of a canal system that is fed by low DO groundwater; high conductance is expected because the canal is very close to Biscayne Bay and east of the saltwater intrusion line; and three coliform exceedances are a normal occurrence in runoff discharges (AFCEE, 2001).

Past on-base disposal practices in the area where the old sewage treatment system existed (previously located in the rectangular tract immediately south of the stormwater reservoir) resulted in the contamination of sediments in Military Canal and the stormwater reservoir. The contaminated sediments were addressed as part of former Homestead AFB's Installation Restoration Program (IRP) under CERCLA. Regulatory issues concerning the contaminated sediments were resolved through a ROD-dictated remediation project (i.e., encapsulation of the canal and portions of the reservoir) that prevents these contaminants from migrating to BNP.

The FDEP classification for all water bodies within HARB is "Class III Surface Waters" designated for recreation and maintenance of a healthy, well-balanced fish and wildlife population (Chapter 62-302.400, Florida Administrative Code [F.A.C.]). Three lakes are within the 1,943-acre HARB, comprising approximately 30.2 acres or less than 2 percent of the installation.

All the lakes on HARB are man-made, created from limestone borrow pits many decades ago. When first created, these types of pits typically are deeply excavated, resulting in limited habitat value, but through time, the process of erosion and sedimentation eventually transforms them into more natural features. HARB's lakes are typically shallow with steep banks that contain many old tree snags and other vegetation debris, which create good edge habitat for many species. Many snags also remain standing and are used extensively by osprey, kingfisher, cormorant, and other bird species for resting and feeding.

The 14.5-acre Phantom Lake is just north of the Munitions Storage area along the western boundary of the base (Figure 4-4). A maintained unpaved road encircles the lake and provides access. The Twin Lakes, also referred to as the North and South Flight Line Lakes (7.7 and 8.0 acres, respectively), are southeast of the runway (Figure 4-4). Only the North Lake has a surface water connection to the Boundary Canal system.

4.4.2 Groundwater and Potable Water

Three hydrologic units are present in the Homestead area. These include, in descending order, the Biscayne aquifer, the Intermediate Confining Unit, and the Floridan aquifer system. The Biscayne aquifer extends from land surface to depths of about 80 to 100 feet below HARB vicinity (Fish and Stewart, 1991). The Biscayne aquifer is designated by the U.S. Environmental Protection Agency (USEPA) as a "sole-source" potable water supply for Broward, Miami-Dade, Monroe, and Palm Beach Counties. This designation under the Safe Drinking Water Act affords stringent protection for the aquifer. Projects that receive federal funds within the designated area are subject to review by USEPA to ensure that they do not endanger the water source (USEPA, 2002).

Because of its proximity to the land surface and connection to surface water hydrology, the Biscayne aquifer is susceptible to contamination. The aquifer is under unconfined, or water table conditions and is affected by rainfall events, channel flows, local surface water bodies, and consumptive use pumping. There is a direct relationship between the Biscayne aquifer and the canals that transect it. During extended periods of low rainfall, water levels in the canal system decrease, thus allowing the inland movement of saltwater, contributing to coastal seepage. However, this has been largely alleviated by the construction of large-scale canal control structures near the coastal ends of the major canals that prevent the movement of saltwater up the canals when water levels in the canals are low (Miller, 1990).

The Intermediate Confining Unit comprises interbedded siltstone, claystone, and sand of the Miocene Age Hawthorne Group (Fish and Stewart, 1991). In southern Miami-Dade County, the Hawthorn Group sediments are approximately 800 feet thick (Scott, 1988). The Intermediate Confining Unit hydraulically isolates the Biscayne aquifer system from the underlying Floridan aquifer system. The Intermediate Confining Unit is underlain by the Floridan aquifer system.

The Floridan aquifer is divided into the Upper Floridan aquifer and the Lower Floridan aquifer. Underlying HARB, the Lower Floridan aquifer exhibits variable artesian head, is approximately 950 to 1,000 feet below sea level at its uppermost, and is 2,800 feet thick (USAF and FAA, 2000). The Lower Floridan aquifer is much less permeable than the Upper Floridan aquifer and contains saltwater. Because of mineralization and high salinity values, the Lower Floridan aquifer in the general vicinity of HARB exceeds primary drinking water standards and is unsuitable as a potable water supply.

Due to saltwater intrusion to portions of the Biscayne aquifer beneath the base, potable drinking water on the base historically was supplied by off-base wells dating back to 1992 (ATSDR, 1998). The potable water supply system for the former Homestead AFB historically included water supply wells, a water treatment plant, water storage tanks, and a distribution network. Several well fields were located on Homestead AFB. The on- and off-base well fields are no longer in use and the wells have been officially abandoned. Starting in December 2005, potable water has been supplied by Miami-Dade County Water and Sewer Department (WASD). The aforementioned water treatment plant and water storage tanks were demolished and removed before December 2005.

4.4.3 Stormwater Discharge and Wastewater

HARB is covered under a stormwater Multi-Sector General Permit (MSGP) issued by the FDEP for stormwater discharges associated with industrial activities (Rule 62-621.300[5], F.A.C.). Instead of controlling discharges through numerical limits, stormwater is controlled by adherence to the HARB SWPPP (HARB, 2012), which was prepared in accordance with AFI 32-7041, "Water Quality Compliance."

Stormwater collected from industrial areas is eventually discharged into the non-industrial stormwater systems throughout HARB. The MSGP does not require HARB to conduct stormwater monitoring, but HARB has conducted voluntary monitoring of its stormwater discharges (HARB, 2012).

Primary stormwater pollution concerns within HARB include potential spills from petroleum, oils, and lubricants (POL). The greatest potential stormwater contaminant is jet propulsion (JP)-8 fuel because of the large quantities used at the base. For example, between 2003 and 2012, of the seven recorded significant spills, two were of JP-8, ranging from 160 to 350 gallons (HARB, 2012). Areas with the highest potential for stormwater contamination because of their frequent use on HARB are the base service station and parking areas. Contamination also may result from the non-HARB portions of former Homestead AFB since the Boundary Canal remains interconnected with the former base canal system.

In the event of a reportable spill (more than 25 gallons on pervious surfaces or more than 100 gallons on all other surfaces), HARB must submit a report to USEPA Region IV within 14 days of the release (HARB, 2012). The SWPPP also must be modified to include a description of the release, circumstances leading to the release, the date of the release, and measures that will prevent the reoccurrence of such a release (HARB, 2012).

The domestic wastewater treatment plant was closed and decommissioned in 1984. Miami-Dade WASD provides wastewater treatment and disposal for the base under contract to the AFRC (USAF and FAA, 2000). There are no industrial wastewater or stormwater disposal wells at HARB. Some of the wastewater treatment units at industrial areas are closed-loop-recycle systems that constantly treat and reuse the same wash water.

HARB has six industrial wastewater operating permits prepared in accordance with Chapter 24, Miami-Dade County Code (Environmental Protection Ordinance). Permits cover all waste-generating activities on HARB (including the FANG). Primary waste-generating activities include all hazardous waste storage, vehicle maintenance, aircraft washing and maintenance, and POL storage activities. HARB facilities covered under these permits include: the Military Aircraft Jet Engine Testing Facility, POL Tank Farm, Buildings 185, 192, 193, 194, 200, 706,

and 4709; Composite Maintenance Building; Base Supply Building; Hazardous Materials Building; Air Station Truck Maintenance; Motor Vehicle Maintenance; Vehicle Washrack; and Civil Engineering Building.

Chapter 5 Ecosystems and the Biotic Environment

HARB has been divided into 14 land management units to support the broader mission-driven land uses on HARB (Figure 5-1). This is particularly critical since the entire base is fully utilized for mission activities, and the natural features must co-exist within these intensively managed efforts (see Figure 5-2). The mission requirements of the broader land use categories present both opportunities and constraints for the management of vegetation and wildlife. The 14 areas have been designated based on geographical location, mission support requirements, and similar habitat types. Land management units are used, in part, to provide the user of this plan with geographic reference points for conducting management activities. The units and approximate acreages discussed in detail in this INRMP are:

- Remnant Pine Rockland: 5.1 acres
- Phantom Lake, including the Old Grenade Range: 93.8 acres
- Southeast Triangle: 51.9 acres
- Munitions Area: 122.0 acres
- Northeast Grasslands: 50.5 acres
- Operable Unit 2 (OU-2): 21.1 acres
- Grenade Range and Reserves Area: 116.6 acres
- Southwest Clear Zone: 57.0 acres
- Hush House Area: 30.6 acres
- Wetland Marsh Area: 34.7 acres
- Twin Lakes and Wetland Fringe: 40.8 acres
- Airfield Area: 945.3 acres
- Boundary Canal: 40,400 linear feet
- Administrative and Industrial Support: 334.3 acres

5.1 Ecosystem Classification

HARB is in the Southern Florida Coastal Plain ecoregion, which covers an area of approximately 22,407 square kilometers (km^2) (8,651 square miles [mi^2]) across the lower portion of the Florida peninsula, from Lake Okeechobee south to the Florida Keys. It consists of flat plains with wet soils, marshland and swamp land cover with everglades and palmetto prairie vegetation types. The environment of this ecoregion is generally nutrient-poor, particularly in the Everglades, which has historically been subject to runoff from urban and agricultural sources, leading to changes in habitat health and diversity. Surface water levels and sheet flow in the Everglades are sensitive to differences in topography. The ecoregion is large and features a flat terrain, with changes of only a few centimeters in elevation; this can have significant impacts on types of plant and animal communities present.

The subtropical climate is generally frost-free and consists of a wet season and dry season. On average, 1,400 millimeter (mm) (55 inches) of rain falls annually in the ecoregion, with approximately 1,060 mm (42 inches) of rainfall occurring during the wet season between June and September. The warm dry season, from October to May, permits year-round crop production and has been important in the cultivation of winter vegetables. Sugarcane is widely grown and has formed the basis of the domestic sugar industry since the early 1960s. Between 1950 and 1970, the ecoregion underwent extensive land cover change, primarily due to the implementation of water control measures, improvements in transportation infrastructure, mosquito control

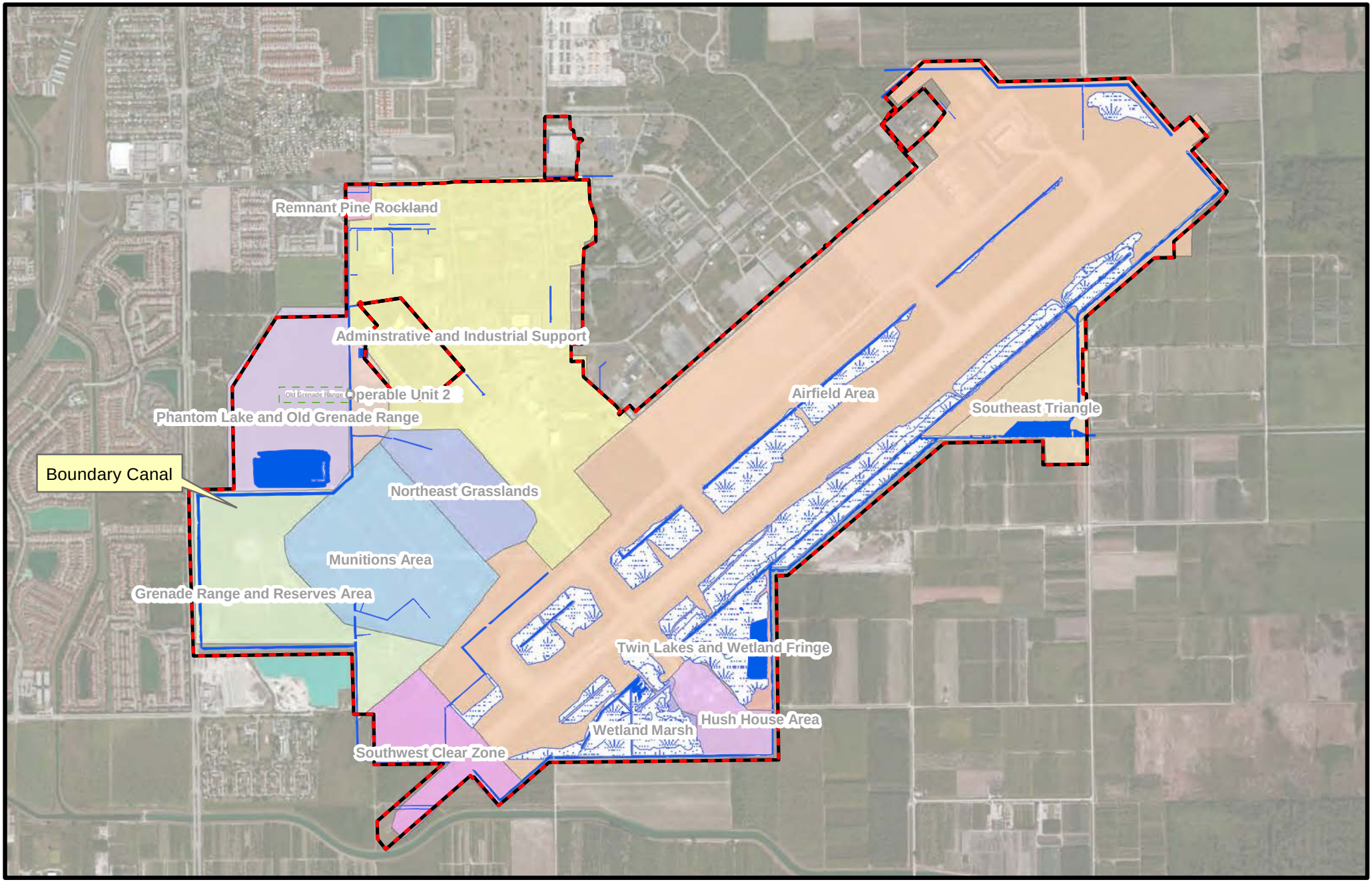


Figure 5-1
HARB Land Use Management Areas
Protected Plant Management Plan
Integrated Natural Resources Management Plan
Homestead Air Reserve Base, Florida

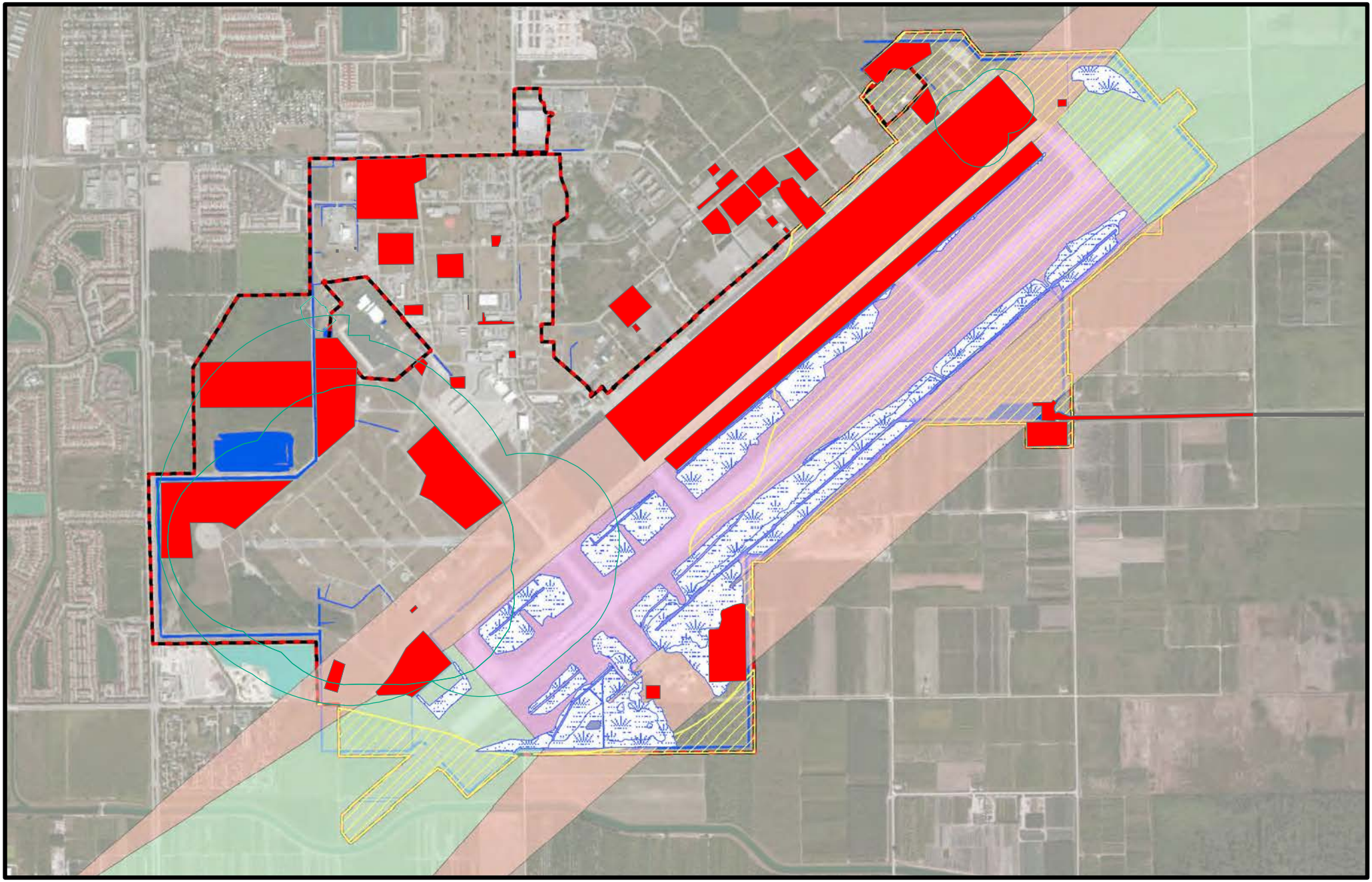


Figure 5-2
Land Use Constraints
Integrated Natural Resources Management Plan
Homestead Air Reserve Base, Florida

measures, widespread use of air conditioning, and efforts on the part of developers and government officials to promote Florida's growth potential (U.S. Geological Survey [USGS], 2012).

5.2 Historic and Current Vegetation

HARB is within the historic range of the Everglades watershed and prior to development was probably comprised of a mixture of freshwater marsh and isolated tree islands (including pine rockland communities). Within HARB and the surrounding region, little remains of these original communities. Although remnant natural communities exist in very scattered patches, most have experienced extensive surface alterations during development and/or severe infestations by invasive exotic species.

Freshwater marsh ecological communities are generally characterized as a shallow wetland consisting of low, emergent vegetation with few or no standing trees, and standing water throughout most of the year (NRCS, 1989). The type of marsh that most likely occurred on the base was the marl prairie community, occurring on thin calcitic soil (i.e., marl) over limestone bedrock (AFRC, 1997). Typical vegetation of marl prairies includes beak rush (*Rhynchospora inundata*), spike rushes (*Eleocharis* spp.), white top sedge (*Rhynchospora colorata*), and hairawn muhly (*Muhlenbergia capillaris*). Freshwater marsh communities are extremely vulnerable to hydrological changes and the absence of fire. The soft substrate can be easily disturbed and damaged by vehicles (Florida Natural Areas Inventory [FNAI], 2010).

Florida pine rockland is an endangered natural community that is found only in south Florida on relatively flat upland terrain that is moderate to well drained. Pine rockland habitat is characterized as an open canopy of slash pine that contains a large number of endemics within the patchy shrub understory and variable ground cover and occurs along scattered outcrops of oolitic limestone formations of the coastal ridge (AFRC, 1997). As a result of the rocky ground, pine rockland plants are adapted to conditions where there is very little soil, usually grow very slowly, and develop complex root structures or other specialized methods for absorbing nutrients (Miami-Dade County Department of Environmental Resource Management [DERM], 2002). Typical trees and shrubs include rough velvetseed (*Guettarda scabra*), indigo berry (*Randia aculeata*), varnish leaf, (*Dodonaea viscosa*), wax myrtle (*Morella cerifera*), poisonwood (*Metopium toxiferum*), myrsine (*Myrsine floridana*), Christmas berry (*Crossopetalum ilicifolium*), cabbage palm (*Sabal palmetto*), saw palmetto (*Serenoa repens*), silver palm (*Coccothrinax argentata*), brittle thatch palm (*Thrinax morrisii*, also known as Key thatch palm), West Indian lilac (*Tetrazygia bicolor*), marlberry (*Ardisia escallonioides*), mangrove berry (*Psidium longipes*) (also known as longstalked stopper), winged sumac (*Rhus copallinum*), Florida bluestem (*Schizachyrium rhizomatum*), silver bluestem (*Andropogon cabanisii*), Florida five-petaled leaf flower (*Phyllanthus pentaphyllus*), arrowleaf threeawn (*Aristida purpurascens*), lopsided Indiangrass (*Sorghastrum secundum*), hairawn muhly, Rocklands noseburn (*Tragia saxicola*), devil's potato (*Echites umbellata*), pineland croton (*Croton linearis*), and pineland jacquemontia (*Jacquemontia curtisii*). The characteristic set of species includes the South Florida slash pine (*Pinus elliottii* var. *densa*), Christmas berry, maidenhair pineland fern (*Anemia adiantifolia*), Florida silver palm, and Florida white top sedge (*Rhynchospora floridensis*) (FNAI, 2010).

Pine rocklands have been subject to intense development pressure because their higher elevations made them suitable for building sites because of the legal restrictions on filling and developing

in wetlands. Less than 3 percent of pine rockland communities remain outside of Everglades National Park and these remaining areas are in poor condition because of improper management, geographic isolation, or natural disturbance (Cox et al., 1994). In 1992, Hurricane Andrew severely damaged many of the south Florida pine rocklands, resulting in further damage to these communities. High winds damaged tree limbs and canopies and sheared off or broke the trunks of many trees. The remaining trees were stressed and were then attacked by bark or boring beetles, usually the six-spined Southern pine beetle, which is ubiquitous in south Florida. Following Hurricane Andrew, the pine beetle population grew geometrically in response to the available damaged slash pine resource (Hilsenbeck, 1993).

Because this habitat type has been eliminated from much of its former range, pine rockland communities support a diverse array of rare or listed plant and animal species, many of which are dependent upon frequent fire. The need for fire every 3 to 10 years also is important to keep pine rockland from succeeding to rockland hammock. If understory development progresses for more than 8 to 10 years, the fire either cannot penetrate or fires will become catastrophic because of excessive fuel accumulation (FNAI, 2010).

Even though much of the base is developed or disturbed, some areas continue to support remnants of important natural communities that contain listed and rare species. The most important of these communities is the Remnant Pine Rockland area because of the number of rare and protected species that require the conditions afforded by this type of habitat. The natural communities on the base could benefit from restoration efforts combined with proper management and continued maintenance for minimizing the invasion of exotic plant species. While the use of fire is not feasible due to the proximity of HARB's fuel tank farm to the east and a charter school west of the Remnant Pine Rockland area, mechanical reduction of the fuel load could benefit the natural environment and enhance safety features of the base.

The following section describes the current state of natural upland and wetland vegetative communities on HARB. Areas of high quality natural communities on HARB have been identified in several previous surveys (e.g., Hilsenbeck, 1993; Argonne National Laboratory [Argonne], 1997; Golder and Associates [Golder], 2012a). Plants generally associated with these areas are summarized below, and a complete list of native and non-native plant species observed at HARB is included in Appendix H.

- The **Remnant Pine Rockland** community at HARB contains many native Florida species, including species specifically associated with pine rockland community types, such as Florida slash pine saplings (a keystone species in pine rocklands). State-protected species include locust berry (*Byrsonima lucida*), Christmas berry, and West Indian lilac. These observations were confirmed by a more in-depth vegetation survey performed in late 2004. No federally listed species were encountered. Hurricane Andrew heavily impacted the area in 1992, resulting in immediate and long-term damage to the slash pines. The area currently contains an open canopy with a heavy understory of mostly herbaceous species, such as pineland croton, blue porter weed (*Stachytarphetta jamaicensis*), small composites (formerly genus *Aster*), and Florida white top sedge. Several state-listed species (e.g., West Indian lilac) have been noted (Golder, 2012a).

  In May 2009, a federally listed endangered species, Small's milkpea (*Galactia smallii*), and a federal candidate species for listing, sand flax (*Linum arenicola*) were found in a Remnant Pine Rockland tract and swale immediately east of the tract within former

Homestead AFB property on the east side of HARB. Both of these species are small, low-to-the-ground plants, not readily recognizable when not in flower. Subsequent surveys conducted in early 2013 found populations of Small's milkpea and sand flax throughout HARB. Populations were mainly concentrated in the west-central portion of HARB, primarily in the munitions area, which is less disturbed and has a higher quality of habitat than most other areas on the base. Populations of Small's milkpea and sand flax are further discussed in the Protected Plant Management Plan (PPMP) (Appendix E). Invasive exotic plant species are also present in this Remnant Pine Rockland area. The area contains a small stand and many saplings of Australian pine (*Casuarina equisetifolia*). A dense stand of Burma reed (*Neyraudia reynaudiana*) and Napier grass (*Pennisetum purpureum*) is in the center of the site and along the boundary to the north and west of the Boundary Canal. These invasive exotic species are quickly becoming established throughout the site and are out-competing native species.

- **Phantom Lake and the Old Grenade Range** are described together here. The dominant species of vegetation in the Phantom Lake area include exotics such as Burma reed and Australian pine. Although these two exotic species tend to form monocultures that eventually out-compete native species, the canopy remains open in many areas and allows for some growth of both herbaceous and woody native species, including state protected species such as satin leaf (*Chrysophyllum oliviforme*), wedgelet fern (*Sphenomeris clavata),* pineland jacquemontia, and locust berry. Many of the native trees, such as locust berry and satin leaf, were probably established prior to the invasion of exotics and are tall enough to avoid becoming shaded and subsequently eliminated. Other native species, such as the wedgelet fern, pineland jacquemontia, and small-leaf melanthera (*Melanthera parvifolia*), appear to comprise the dominant groundcover along the access road and near Phantom Lake. The lake, which is a former limestone borrow pit, contains a shallow area in the middle exhibiting emergent vegetation surrounded by deepwater habitat along the shoreline. During initial studies under the USAF Military Munitions Response Program (MMRP) that were performed between 2005 and 2008, most of the former range was found to be covered by dense growths of invasive species, such as Burma reed and Brazilian pepper (*Schinus terebinthifolius*). However, in the interior of the southern end of the study area, a number of pineland species were found in an undisturbed area. The canopy remains open in many areas and allows for some growth of other herbaceous and woody species. Many native species occur here and account for much of the ground cover along the road and near the lake.
- The **Southeast Triangle** historically consisted primarily of dense monotypic stands of the invasive exotic plants Brazilian pepper and Napier grass, while Australian pines bordered most areas along the canal. Maintained grassy areas bordered the access roads. In 2001, many large native (e.g., Florida trema [*Trema micranthum*], and non-native (e.g., avocado [*Persea americana]*) trees were identified (HARB, 2002a). These were scattered throughout and were most likely individuals established prior to the encroaching invasive exotic plant species. No threatened or endangered species were observed in this area, and with the exception of areas along the access roads, very few native herbaceous and shrub species (e.g., leather fern [*Acrostichum danaeifolium*] and wax myrtle) were identified due to the lack of open canopy necessary for their becoming established. Since the 2009 INRMP, the Southeast Triangle has undergone significant

vegetation clearing to comply with security force protection measures. All trees have been cleared from the area, including the canal banks.

- The **Munitions Storage Area** and adjacent **Northeast Grasslands** contain mostly non-native, grass species (e.g., Bermuda [*Cynodon dactylon*], Bahia [*Paspalum notatum*], and St. Augustine [*Stenotaphrum secundatum*]) and the area is maintained with continual, year-round mowing to support a 2- to 4-inch vegetation height requirement; however, state-protected species have been observed in the Munitions Storage Area and Northeast Grasslands, including locust berry, Bahama ladder brake fern (*Pteris bahamensis*), Porter's spurge (*Chamaesyce porteriana*), Florida lantana (*Lantana depressa*), and small-leaf melanthera. Large populations of the federally endangered Small's milkpea and the candidate species sand flax have been documented in both areas.
- **Operable Unit (OU) -2** is a fenced-in, restricted IRP area. Based on discussion with HARB personnel and observations from the periphery, the area contains only impenetrable monocultures of Brazilian pepper, Burma reed, and a variety of exotic tree species (Australian pine, avocado, etc.).
- The **Grenade Range and Reserves Area** is characterized by mostly undeveloped conditions with a mix of open grasslands, small monotypic stands of Australian pine, and other exotic plant species. Although the Grenade Range as a whole does not contain the dense populations of exotic plants characteristic of other sections of HARB, some areas support significant invasive plant growth. Generally, the canopy remains open and supports many native species (e.g., gumbo limbo [*Bursera simaruba*]), including state-listed species (e.g., locust berry and wedgelet fern).
- The **Southwest Clear Zone** contains mostly non-native, grass species and the area is maintained and mowed year-round. Listed native plants, such as the pine pink orchid (*Bletia purpurea*), Porter's spurge, satin leaf, Christmas berry, West Indian lilac, and Florida lantana, have been identified in past surveys.
- The **Hush House Area** substrate primarily is exposed limestone, with a few areas having a thin mantle of sand overlying the rock. Vegetation is a mixture of exotic species, such as Australian pine, Brazilian pepper, and Napier grass, and native species, such as Florida trema, Florida white top sedge, and myrsine.
- The **Wetland Marsh Area** consists primarily of cat-tail and spike rushes. Vegetation includes small-leaf melanthera, Bahama ladder brake fern, Christmas berry, and wild potato morning glory (*Ipomoea microdactyla).*
- **Twin Lakes and Wetland Fringe areas** are described together here. The lakes consist of two deepwater, former borrow pits, with an emergent wetland fringe composed primarily of cattails (*Typha* spp.) and spike rushes. Small re-growth Australian pines from a prescribed burn still surround the lake and provide some roosting areas for wildlife.
- A substantial amount of the jurisdictional freshwater wetland communities are located in the **Airfield area**, which comprise the dominant land type. Wetland vegetation is maintained by frequent mowing or herbicide treatment in locations that are saturated or have standing water. Predominant plant species include white top sedge, spike rush (*Eleocharis cellulosa*), hurricane-grass (*Fimbristylis cymosa*), torpedo grass (*Panicum repens*), pennywort (*Hydrocotyle bonariensis*), and water hyssop (*Bacopa caroliniana*).

- The **Boundary Canal** system is a freshwater system even though there is a hydrologic connection (via Military Canal) to the nearby waters of Biscayne Bay. The berms along several areas of the Boundary Canal, particularly in the western segment, historically contained many native trees, such as West Indian lilac, coco plum (*Chrysobalanus icaco*), and myrsine. These trees have been removed and the banks of the boundary canal are now regularly kept clear of vegetation for security force protection.
- The **Administrative and Industrial Support area** is mostly urbanized but contains some disturbed habitat that continues to support a number of native species and communities, particularly just south of the Remnant Pine Rockland area. The site is mostly mowed Bermuda grass, but there are also prairie-like areas that are less frequently mowed containing native and non-native shrubs and trees. Protected plant species in this area include locust berry, mahogany (*Swietenia mahagoni*), silver palm, Christmas berry, Krug's holly (*Ilex krugiana*), pineland jacquemontia, and wedgelet fern. A number of small canals are interspersed throughout the area.

5.2.1 Turf and Landscaped Areas

Landscaping design criteria for HARB are established in the Base General Plan (HARB, 2006b). As required within the plan, the landscaping effort is to create an overall image for the base through the consistent use of landscape materials that are visually and environmentally compatible with their surroundings.

Grounds maintenance activities at HARB are conducted in accordance with the Statement of Work (SOW) for Grounds Maintenance of the Cantonment and Munitions Area at Homestead Air Reserve Station Florida (Appendix F). See Figure 5-3 for the grounds maintenance mowing plan. The SOW requires the contractor to obtain and maintain all licenses/certifications required by the State of Florida and federal agencies for supervision and applications of herbicides/ pesticides in accordance with 40 CFR 171.9, Florida Statues Chapter 482 "Pest Control", and AFI 32-1053.

Types of services required by the SOW include:

- Mowing and trimming grass and removing grass clippings from improved grounds
- Edging
- Maintaining and pruning shrub, hedges, and perennial flowers
- Maintaining shrub beds
- Maintaining drainage ditches

5.3 Fish and Wildlife

HARB currently holds a Category 1 classification, as defined by AFI 32-7064, and has suitable habitat for conserving and managing fish and wildlife. In general, all of the species present on the base are at low, but stable, population levels.

Very few areas of HARB support sensitive vertebrate species. HARB has limited suitable habitat to support sensitive plant species. Nonetheless, these areas contribute important habitat to the remaining natural plant communities. The relatively small size of the base and its urban setting preclude management activities for the consumptive use of wildlife resources. Additional details are provided in the Threatened and Endangered Species Survey and Management Plan (e^2M, Inc, 2005a).

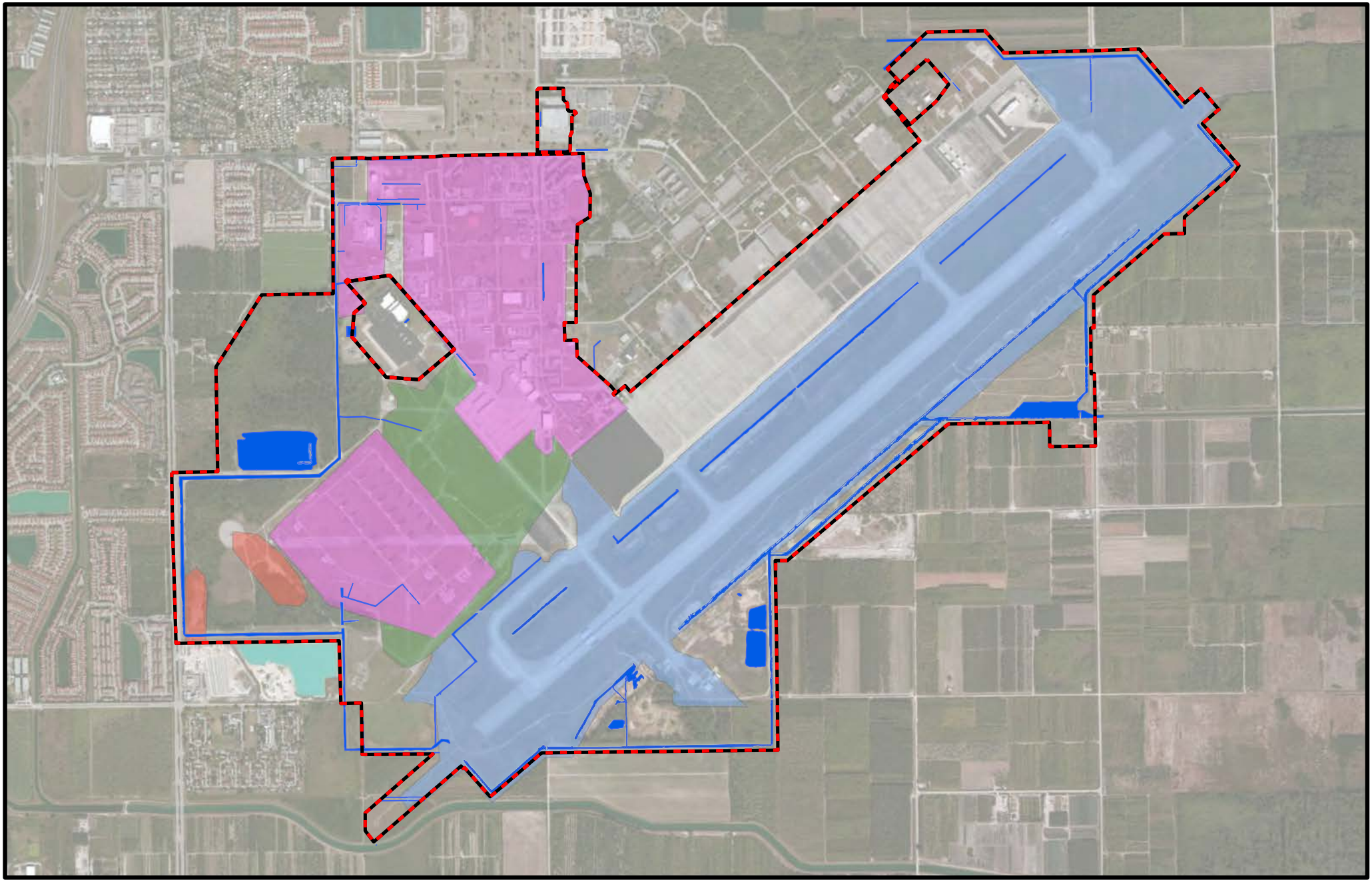


Figure 5-3
Grounds Maintenance Mowing Plan
Integrated Natural Resources Management Plan
Homestead Air Reserve Base, Florida

5.3.1 Historic and Current Wildlife Conditions

Prior to urban development in south Florida, the HARB area would have supported a diverse range of wildlife species, many of which are imperiled today, such as the Florida panther (*Puma concolor coryi)*, American crocodile (*Crocodylus acutus*), eastern indigo snake (*Drymarchon corais couperi*), and wood stork (*Mycteria americana*). While most of HARB has been developed and the remaining natural communities have been disturbed, other native and non-native wildlife species continue to use the habitat available on HARB. Typical animal species found in pine rocklands include southeastern five-lined skink (*Eumeces inexpectatus*), ringneck snake (*Diadophis punctatus*), pygmy rattlesnake (*Sisturus militarius*), red-shouldered hawk (*Buteo lineatus*), pine warbler (*Dendroica pinus*), opossum (*Didelphis virginiana*), marsh rabbit (*Sylvilagus palustris*), cotton rat (*Sigmodon hispidus*), cotton mouse (*Peromyscus gossypinus*), raccoon (*Procyon lotor*), white-tailed deer *(Odous virginianus),* and bobcat (*Lynx rufus*). Rare fauna recorded in pine rocklands of south Florida include the Florida bonneted bat (*Eumops floridanus*), Florida evening bat (*Pipistrellus subflavus*), mastiff bat (*Eumops glaucinus floridanus*), Florida burrowing owl (*Athene cunicularia floridana*), gopher tortoise (*Gopherus polyphemus*), eastern indigo snake, rim rock crowned snake (*Tantilla ooltica*), and Florida atala butterfly (*Eumaeus atala* (USAF and FAA, 2000; Friers, personal communication).

Animal species recorded on HARB include state-protected species such as burrowing owls in the Munitions Area, in the Northeast Grasslands, along Flightline Road, and possibly in the Administrative and Industrial Support areas. Additional species commonly seen on HARB are wading birds and ducks that utilize the Airfield wetlands, Wetland Marsh, Boundary Canal, and the lakes, including egrets, herons (*Egretta* sp.), white ibis (*Eudocimus albus*), American white pelican (*Pelecanus erythrorhynchos*), mottled duck (*Anas fulvigula*), Black-bellied Whistling-Duck (*Dendrocygna autumnalis*), and blue-winged teal (*Anas discors*). Other birds include double-crested cormorant (*Phalacrocorax auritus*), wood stork, and red-shouldered hawk. On HARB, freshwater wetlands, lakes (which are former borrow areas), and canals provide foraging and nesting habitat for a variety of fish, amphibians, reptiles, and mammals, including largemouth bass (*Micropterus salmoides*), warmouth (*Lepomis gulosus*), bluegill (*Lepomis macrochirus*), striped mullet (*Mugil cephalus*), Florida gar (*Lepisosteus platyrhincus),* and common snook (*Centropomis undecimalis*).

The American alligator (*Alligator mississippiensis*) and exotic spectacled caiman (*Caiman crocodilus*) also are common inhabitants of the freshwater canals and lakes on HARB. In addition, the American crocodile is a consistent resident of the Twin Lakes. Other reptiles and amphibians include rough grass snake (*Opheodrys aestivus*), corn snake (*Elaphe guttata*), checkered garter snake (*Thamnophis marcianus*), Florida slider (*Trachemys scripta*), Florida soft shell turtle (*Apalone ferox*), snapping turtle (*Chelydra serpentina*), Florida chorus frog (*Pseudacris nigrita verrucosa*), tree frogs (*Hyla* sp.), and two-toed amphiuma (*Amphiuma means*). Raccoons, coyotes (*Canis latrans*), red-phased gray fox (*Urocyon cinereoargenteus*), river otters (*Lontra canadensis*), bobcat, and marsh rabbits are common mammal species observed on the base (USAF and FAA, 2000). Raccoons and coyotes may also affect populations of other wildlife species through nest predation or direct predation.

The Earth and Environment Department of Florida International University conducted a survey at HARB and produced the report *An Assessment and Inventory of Fishes at the Homestead Air Reserve Base, Homestead, FL* (Gandy and Rehage, 2013). The objective of the survey was to examine and inventory fish communities in the man-made habitats located within HARB and to

investigate and compare the influence of native vs. non-native fish taxa and of estuarine/coastal vs. freshwater fish species. Samples were collected from the Perimeter Canal and from the Stormwater Reservoir using a boat-mounted electrofishing unit. Each fish was identified, measured, and weighed (Gandy and Rehage, 2013).

Over the course of 2 sampling events, 258 fishes were collected and observed. This number included 66 natives, 62 non-natives, and 128 euryhaline species, indicating that euryhaline species were the most common group found overall. The euryhaline species mainly included striped mojarra (*Eugerres plumier*), with striped mullet and gray snapper (*Lutjanus griseus*) also present. The native fishes were 25.3 percent of the surveyed sample and included Florida gar, American eel (*Anguilla rostrata*), largemouth bass and sunfishes, many of which were bluegill. The least common fish group identified was non-native fishes (23.8 percent), which included Mayan cichlid (*Cichlosoma uropthalmus*) and blue tilapia (*Oreocrhomis aureus*). It was also concluded that the Perimeter Canal contained more diverse fish populations and larger numbers of native, non-native, and euryhaline fish, when compared to the Stormwater Reservoir (Gandy and Rehage, 2013).

The following describes the current wildlife and habitat assessment by land use management area on HARB. However, wildlife assessments were not conducted for the Southwest Clear Zone and Hush House area due to lack of suitable habitat.

- Wildlife observations within the **Remnant Pine Rockland** area have consisted of only avian species and include mockingbird (*Mimus polyglottos*), osprey (*Pandion haliaetus*), double-crested cormorant, and red-bellied woodpecker (*Melanerpes carolinus*). All observations, except for the red-bellied woodpecker, were of birds flying in the general area
- Wildlife sighted in the **Phantom Lake and Old Grenade Range** area include yellow-rumped warbler (*Dendroica coronata*), belted kingfisher (*Ceryle alcyon*), mockingbird, anhinga (*Anhinga anhinga*), and osprey. These birds have been observed foraging, perching, and nesting in the area. The American alligator and spectacled caiman were both observed in the Phantom Lake (AMEC, 2012). The proximity of the lake to the canal system provides accessibility for both species and several gently sloping areas around the lake typically exhibit signs of frequent use. Several small snake holes have been noted along the banks of the lake. Phantom Lake contains a shallow middle area with emergent vegetation surrounded by deepwater habitat along the shoreline. This diversity of water levels and aquatic vegetation provides habitat for native fish species such as largemouth bass, tarpon (*Megalops atlanticus*), snook, Florida gar, and panfish (*Lepomis* spp.). Exotic fish species that may occur in Phantom Lake include cichlids such as *Cichlasoma* spp., the Oscar *(Astronotus ocellatus)*, and tilapia (*Tilapia* spp.).
- Many birds have been observed foraging in the immediate vicinity of the **Southeast Triangle**. The proximity to the bay, the availability of fish in the canals and reservoir, the open grassy areas provide a diverse habitat for wildlife. Species observed include double-crested cormorant, reddish egret (*Egretta rufenscens*), anhinga, osprey, American coot (*Fulica americana*), and red-bellied woodpecker.
- The **Munitions Area** and **Northeast Grasslands** are frequently used by burrowing owls for nesting and foraging. Although burrowing owls are usually dependent on the burrows of other animals, in Florida the owls are known to excavate their own burrows in sandy

soils. The owl population on HARB may consist of both year-round non-migratory individuals and winter migrants. Burrowing owls use fence posts and other high perches to hunt small reptiles, amphibians, and insects. Grounds maintenance within the Munitions area includes year-round mowing to support a 2- to 4-inch vegetation height pattern. Buffers are established around owl burrows where grass is left in the rough. However, no study of owl burrows has been performed to support recommendations to further the use of buffers throughout HARB in suitable areas.

- Given the composition of the seed-producing grasses, many small mammals would be expected to use the **Grenade Range and Reserves Area** for foraging. As a result, this area provides good foraging grounds for birds such as osprey and turkey vultures (*Cathartes aura*) that feed on small mammals. Many Australian pine snags exist in the area and provide good perching and foraging sites for these birds. The proximity of this area to the Boundary Canal also provides an opportunity for birds whose primary diet is fish. Birds noted in this area include the American coot, yellow-rumped warbler, belted kingfisher, loggerhead shrike (*Lanis ludovicianus*), mockingbird, and Northern rough-winged swallow (*Stelgidopteryx serripennis*).
- The **Wetland Marsh Area** supports habitat important to many native bird species. Birds sighted during surveys include wading birds that typically use this type of shallow wetland habitat for foraging. Species observed in the area include the great egret (*Ardea alba*), great blue heron (*Ardea herodias*), cattle egret (*Bubulcus ibis*), green-backed heron (*Butorides striatus*), little blue heron (*Egretta caerulea*), reddish egret, snowy egret (*Egretta thula*), tricolored heron (*Egretta tricolor*), white ibis, and double-crested cormorant (*Phalacrocorax auritus*). One raptor species, the red-shouldered hawk has also been observed. The wetland and surrounding uplands also provide habitat for small mammals and snakes native to south Florida. Raccoon tracks and gastropod shells have been observed in this area.
- American alligator, American crocodile, and spectacled caiman are known to inhabit the **Twin Lakes**. Alligator and crocodile access paths are common along the lake edges. Native fish species common within the deepwater habitat of Twin Lakes are those commonly found in south Florida, including largemouth bass, gar, and panfish. Exotic fish species that may occur in the Twin Lakes include cichlids such as *Cichlasoma* spp., Oscar, and tilapia.
- Most **Airfield** wetlands are mowed to maintain 7-inch to 14-inch vegetation height year-round for compliance with airfield safety clearance and BASH criteria. Species observed in the mowed wetlands include Eastern meadowlark (*Sturnella ludovicianae*) and Southeastern American kestrel (*Falco sparverius paulus).* Fish and wildlife use is concentrated in portions of the site that remain saturated or inundated for longer periods. Species observed in these areas included terns (*Sterna* spp.), great egret, cattle egret, snowy egret, great blue heron, green-backed heron, little blue heron, tricolored heron, American alligator, and spectacled caiman.
- The **Boundary Canal** provides deepwater habitat and a route of dispersal for the fish species at HARB. It was constructed by excavating through coral/limestone bedrock and is rectangular in cross section. Water visibility is high and the canal bottom is littered in some areas with fallen Australian pine that provide refuge for fish, amphibians, and

reptiles. The American alligator has been frequently observed in the Boundary Canal (AMEC, 2012). Native fish species common within the Boundary Canal are largemouth bass, gar, and panfish. Tarpon and snook may occasionally occur within the Boundary Canal. Exotic fish species common in south Florida canals that may occur here are the cichlids *Cichlasoma* spp., Oscar, and tilapia.

5.4 Threatened and Endangered Species and Species of Special Concern

5.4.1 Federally Protected Species

Federally designated threatened and endangered (T&E) plants are protected under the Endangered Species Act (ESA) of 1973 (16 United States Code [U.S.C.] §§ 1531-1544, as amended). The listings of these species are maintained and periodically updated by the USFWS. Some federally listed wildlife species are also protected by other federal laws such as the Marine Mammal Protection Act (16 U.S.C. §§1361-1421h), the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 701-715s), and the Bald Eagle Protection Act (16 U.S.C. §§ 668-668c). All federally designated T&E species listed in Miami-Dade County also are protected by the State of Florida; additional state-protected species occurring in Miami-Dade County not otherwise protected by federal jurisdiction under the ESA are described in Section 5.4.2. Habitat loss, water management practices, and fragmentation generally are considered to be the primary significant threats to most of these protected species in Florida. Installations that are known to support federally listed T&E species or habitat critical for these species must address their conservation in their INRMP. While candidate species are not afforded the same protection under the ESA, installations should provide for their protection, when practicable. The federally endangered Small's milkpea and the federal candidate species sand flax are known to occur on HARB (Appendix E).

HARB currently provides limited habitat for attracting and sustaining federally protected species (primarily birds such as the wood stork, which has been observed occasionally on the base). The bald eagle (*Haliaeetus leucocephalus*), which receives protection under the MBTA and the Bald Eagle Protection Act, is also occasionally observed at HARB. HARB is also surrounded by land uses that are similarly limited or unsuitable as habitat and is several miles from park lands and other undeveloped areas that provide conditions favorable to the continued existence of this wildlife. Based on past wildlife surveys and recent field observations, the only federally protected wildlife species confirmed to occur regularly on HARB is the American crocodile, which has been seen in the Twin Lakes area since 2007. The presence of the Florida bonneted bat was recently confirmed due to a mortality incident on the HARB airfield.

Table 5-1 lists federally protected species known to Miami-Dade County. These species, along with their general preferred habitat requirements and potential to occur on-base, are discussed below.

TABLE 5-1
Federally Protected Plant and Animal Species in Miami-Dade County, FL
HARB Integrated Natural Resources Management Plan

Name	Federal Status	Potential to Occur at HARB
INSECTS and SNAILS		
Schaus swallowtail butterfly (*Heraclides aristodemus ponceanus*)	Endangered	No
Miami blue butterfly (*Cyclargus (=Hemiargus) thomasi bethunebakeri*)	Endangered	No
Bartram's hairstreak butterfly (*Strymon acis bartrami*)	Endangered	Yes
Florida leafwing butterfly (*Anaea troglodyta floridalis*)	Endangered	Yes
Stock Island tree snail (*Orthalicus reses nesodryas*)	Threatened	No
REPTILES		
American alligator (*Alligator mississippiensis*)	Threatened due to similarity of appearance to American crocodile	Yes
Hawksbill sea turtle (*Eretmochelys imbricata*)	Endangered	No
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	No
Green sea turtle (*Chelonia mydas*)	Endangered	No
Loggerhead sea turtle (*Caretta caretta*)	Threatened	No
Eastern indigo snake (*Drymarchon corais couperi*)	Threatened	Yes
American crocodile (*Crocodylus acutus*)	Threatened	Yes
Gopher tortoise (*Gopherus polyphemus*)	Candidate	No
BIRDS		
Everglade snail kite (*Rostrhamus sociabilis plumbeus*)	Endangered	Yes
Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*)	Endangered	Unlikely
Bachman's warbler (*Vermivora bachmanii*)	Endangered	Unlikely
Kirtland's warbler (*Setophaga kirtlandii*)	Endangered	Unlikely
Wood stork (*Mycteria americana*)	Endangered	Yes
Audubon's crested caracara (*Polyborus plancus audubonii*)	Threatened	Yes
Piping plover (*Charadrius melodus*)	Threatened	Unlikely
Red knot (*Calidris canutus rufa*)	Proposed Threatened	Unlikely
MAMMALS		
West Indian manatee (*Trichechus manatus*)	Endangered	Yes
Florida panther (*Puma (=Felis) concolor coryi*)	Endangered	Unlikely
Florida bonneted bat (*Eumops floridanus)*	Endangered	Yes
PLANTS		
Florida bristle fern (*Trichomanes punctatum spp. floridanum*)	Proposed Endangered	Yes
Blodgett's silverbush (*Argythamnia blodgettii*)	Candidate	Yes
Florida brickell-bush (*Brickellia mosieri*)	Endangered	Yes
Small's milkpea (*Galactia smallii*)	Endangered	Yes
Sand flax (*Linum arenicola*)	Candidate	Yes
Carter's small-flowered flax (*Linum carteri carteri*)	Endangered	Yes
Garber's spurge (*Chamaesyce garberi*)	Threatened	No
Florida pineland crabgrass (*Digitaria pauciflora*)	Candidate	Unlikely

TABLE 5-1
Federally Protected Plant and Animal Species in Miami-Dade County, FL
HARB Integrated Natural Resources Management Plan

Name	Federal Status	Potential to Occur at HARB
Deltoid spurge (*Chamaesyce deltoidea spp. deltoidea*)	Endangered	Unlikely
Okeechobee gourd (*Cucurbita okeechobeensis spp. okeechobeensis*)	Endangered	No
Beach jacquemontia (*Jacquemontia reclinata*)	Endangered	Yes
Tiny polygala (*Polygala smallii*)	Endangered	Yes
Crenulate lead-plant (*Amorpha crenulata*)	Endangered	Unlikely
Pineland sandmat (*Chamaesyce deltoidea pinetorum*)	Candidate	Yes
Cape Sable thoroughwort (*Chromolaena frustrata*)	Endangered	Unlikely
Florida prairie-clover (*Dalea carthagenensis floridana*)	Candidate	Yes
Florida semaphore cactus (*Consolea corallicola*)	Endangered	Unlikely
Everglades bully (*Sideroxylon reclinatum spp. austrofloridense*)	Candidate	Yes

Schaus Swallowtail Butterfly

The endangered Schaus swallowtail (*Heraclides aristodemus ponceanus*) is a large, dark brown and yellow butterfly. The only known locations for this butterfly are on islands within BNP that contain tropical hardwood hammocks, and on Key Largo. It has not been seen on the mainland since 1924 (Deyrup and Franz, 1994). Habitat preferences are restricted to undisturbed areas with particular types of vegetation such as torchwood (*Amyris elemifera*) and wild lime (*Zanthoxylum fagara*; Gude, 2002). There is no appropriate habitat on HARB to support the Schaus swallowtail butterfly.

Miami Blue Butterfly

The endangered Miami blue butterfly (*Cyclargus thomasi bethunebakeri*) inhabits tropical hardwood hammocks containing balloonvine. It is known from one population in Key West National Wildlife Refuge (NatureServe, 2013). Due to its extreme rarity and the lack of suitable habitat, it is unlikely to occur on HARB.

Bartram's Hairstreak Butterfly and Florida Leafwing Butterfly

The endangered Bartram's hairstreak (*Strymon acis bartrami*) and endangered Florida leafwing (*Anaea troglodyta floridalis*) occur within pine rocklands that contain their only known hostplant, pineland croton (NatureServe, 2013). This plant is known to occur in the Remnant Pine Rockland area, and as a result, both species potentially occur at HARB. A butterfly survey is proposed at HARB (see Chapter 8, Objective 2.10) to determine if these two protected species occur on the installation.

Stock Island Tree Snail

The threatened Stock Island tree snail (*Orthalicus reses)* occurs in hardwood hammocks with calcareous soils in the Florida Keys (NatureServe, 2013). HARB does not have this habitat and the species does not occur on-base.

American Crocodile

Breeding and foraging of federally threatened American crocodiles (*Crocodylus acutus*) regularly occur in Everglades National Park along the shoreline of Florida Bay, in mangrove habitats on North Key Largo, and at Florida Power and Light's Nuclear Electrical Generating Facility at Turkey Point (USFWS, 1999). Adults can disperse great distances. While American crocodiles tend to inhabit more saline waters than American alligators, they also occur in inland ponds and creeks. Access to deep water (greater than 1 meter) is also an important habitat component (USFWS, 1999). Because of their overlapping habitat, the American crocodile is often mistaken for the American alligator, but can be distinguished from the alligator by its narrower snout with the fourth tooth of the lower jaw projecting outside the upper jaw. Because of the difficulty differentiating between these species, the American alligator is listed as federally threatened due to similarity of appearance.

In 1998, extensive crocodile surveys were conducted on the former Homestead AFB, along 37 miles of canals and along 7 miles of the western shoreline of Biscayne Bay (USAF and FAA, 2000). Each location was surveyed three times. No crocodiles were observed on the former Homestead AFB, but the spectacled caiman was common and a few American alligators were observed. During these surveys, the American crocodile was recorded along the coast of Biscayne Bay and at the entrances of Florida City Canal (approximately 3 miles southeast of HARB), Goulds Canal (approximately 3 miles northeast of HARB), Military Canal, and the Fender Point area (USAF and FAA, 2000). Other surveys in 1997 recorded one crocodile each at the mouths of North Canal, Florida City Canal, and Princeton Canal, and in the Black Point and Fender Point areas (USAF and FAA, 2000). There have been regular sightings of crocodiles on HARB at the Twin Lakes since 2007, and there were periodic sightings within Military Canal during the 2003 CERCLA linear emplacement activities.

Eastern Indigo Snake

The threatened Eastern indigo (*Drymarchon corais couperi*) is a large, black, non-venomous snake that is widely distributed throughout central and south Florida, although not commonly seen (USFWS, 1999). Over most of its range, the snake frequents a variety of habitat types including pine flatwoods, scrubby flatwoods, high pine, dry prairie, tropical hardwood hammocks, edges of freshwater marshes, agricultural fields, coastal dunes, and human-altered habitats. They require a sheltered refuge, such as gopher tortoise holes, hollowed root channels, animal burrows, or hollow logs that can protect them from winter cold and drying conditions. Monitoring studies in the Everglades and Florida Keys indicate that the snakes prefer hammocks and pine forests (USFWS, 1999). Indigo snakes, particularly the males, are known to range over large areas throughout the year (perhaps as much as 0.86 mi^2) with most activity occurring in the summer and fall (Moler, 1992). The FNAI reports that indigo snakes were observed in March 1980 and in January 1981 along the Florida City Canal, approximately 2 miles south of HARB, and an indigo snake was observed along the berm of Military Canal in July 1998 (USAF and FAA, 2000).

Surveys for the snake were conducted on the former Homestead AFB in 1992, 1993, 1997, 1998, and 2001. No indigo snakes were observed during these surveys (USAF and FAA, 2000; HARB, 2002a). While this indicates that potential habitat is available along the canals, mangrove swamps, wetlands, and vacant land on or near HARB, these areas are considered to be marginal habitat for the indigo snake. Because HARB is highly developed, it is unlikely that indigo snakes

occur on the base and any use would likely be limited to areas along the boundary fringes, where there have been several unconfirmed sightings or within the Phantom Lake-Old Grenade Range area.

Sea Turtles

Four species of sea turtle forage and breed in the coastal areas of Miami-Dade County: the endangered green sea turtle (*Chelonia mydas*), endangered leatherback (*Dermochelys coriacea*), threatened loggerhead (*Caretta caretta*), and endangered hawksbill (*Eretmochelys imbricata*). While the loggerhead and hawksbill may occur occasionally in the saltwater portion of Military Canal (USAF and FAA, 2000), HARB offers no appropriate nesting or foraging habitat for these and the other sea turtles, and the saltwater barrier and storm-water pumphouse would prevent them from entering the base.

Gopher Tortoise

The candidate gopher tortoises (*Gopherus polyphemus*) require well-drained loose soil for their burrows, adequate low-growing herbs for food, and open sunlit sites for nesting. They are typically associated with xeric scrub oak, coastal strand and dune, live oak hammocks, dry prairie, pine flatwoods, and mixed hardwood-pine communities. Disturbed habitats, such as roadsides, fencerows, clearings, and old fields, often support relatively high densities (Moler, 1992). HARB does not provide appropriate habitat for the gopher tortoise, and burrows have not been seen on the base.

Everglade Snail Kite

The endangered Everglade snail kite (*Rostrhamus sociabilis plumbeus*) is found in freshwater marshes and shallow, vegetated edges of natural or man-made lakes where apple snails can be found. Because of its specific dietary and hydrological requirements, the Everglade snail kite is restricted to the watersheds of the Everglades, Lake Okeechobee, Lake Kissimmee, and the upper St. Johns River.

The snail kite has been observed on HARB, but only on rare occasion and for a short duration. The native and non-native species of apple snails are known to occur on HARB, and the snail kite forages on the native populations.

Cape Sable Seaside Sparrow

The present distribution of the federally endangered Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*) is restricted to two areas of marl prairies east and west of Shark River Slough and flanking Taylor Slough (USFWS, 1999), areas that are distant from HARB. The preferred nesting habitat appears to be mixed marl prairie community that includes muhly grass with short hydroperiods (USFWS, 1999). HARB does not have appropriate habitat or hydrological conditions to support the Cape Sable seaside sparrow, and the species has not been observed on the installation (Friers, personal communication). Based on extensive studies of the sparrow in the Everglades and the habitat conditions on HARB, it is unlikely that HARB would attract or support this species.

Bachman's warbler

The endangered Bachman's warbler (*Vermivora bachmanii*) typically occurs in moist deciduous woodlands and swamps where it forages for insects in dense foliage high in the trees. During migration and winter, this species also uses open woodland, pine, and scrub habitats. This

warbler typically nests in bushes, blackberry vines, or canes or on swamp palmetto leaves. The Bachman's warbler is also protected under the MBTA. This species would not use HARB for breeding purposes, as Florida is not within its breeding range. Any occurrences on HARB would likely be limited to the migration period. However, this species has not been observed on HARB (Friers, personal communication). The species is considered to be possibly extirpated from Florida (NatureServe, 2013). It would be highly unlikely that Bachman's warbler would occur on HARB.

Kirkland's Warbler

The endangered Kirkland's warbler (*Setophaga kirtlandii*) would only occur on HARB as a rare transient forager, but the species has not been observed on the installation (Friers, personal communication). This species summers in the Bahamas and other Caribbean islands and migrates to the lower peninsula of Michigan to breed in dense stands of scrubby jack pine. In the winter the species mainly occurs in low broadleaf scrub, including transient early successional habitats dominated by lantana (NatureServe, 2013). This species is also protected under the MBTA.

Wood Stork

The endangered wood stork (*Mycteria americana*) is a large, long-legged wading bird that breeds in colonies with other species such as the great egret, snowy egret, and white ibis. Although the majority of nesting by the southeastern population no longer occurs in south Florida, the Everglades is an important foraging area, with birds concentrating in shallow wetland areas where fish are plentiful. While wood storks (about 10 to 20) are seen each year flying above HARB, they seem to prefer nearby, off-base shallow canals that are cleaned periodically. The wood stork is also protected under the MBTA. Single or small groups of wood storks (up to 10) are regularly seen foraging on the base in the winter (USAF and FAA, 2000; Friers, personal communication). Even though there is marginal foraging potential on HARB, it is expected that their occurrence on the base would be infrequent and limited to the winter season and nesting would not be likely because of human disturbances.

Audubon's Crested Caracara

The threatened crested caracara (*Polyborus plancus audubonii*) is a large raptor that, in Florida, typically occurs in open country, dry prairie with scattered cabbage palms, wetter prairies, and occasionally in improved pastures and wooded areas with limited areas of open grassland. In Florida the center of its range is the Kissimmee Prairie, which consists of an area of shallow ponds and sloughs with scattered hammocks of live oaks and cabbage palms. This species typically nests in trees among branches or palm fronds and often in cabbage palm. This species is considered a permanent resident of much of Florida but is not common in Miami-Dade County (NatureServe, 2013; Friers, personal communication). This bird could occur on HARB for foraging or for nesting and breeding.

Piping Plover

The threatened piping plover (*Charadrius melodus*) is a small shorebird. They do not breed in Florida but migrate to the state in winter. Winter habitat includes beaches, mudflats, and sand flats. These birds most often forage in areas adjacent to large inlets and passes on the Atlantic coast (USFWS, 1999). Annual Christmas bird counts at the national parks indicate this species used to regularly winter in Miami-Dade County, but piping plovers were recorded only four

times at BNP between 1978 and 1997 (USAF and FAA, 2000). The piping plover is also protected under the MBTA. The occurrence of this species at HARB would be considered extremely rare.

Red Knot

The proposed threatened Red knot (*Calidris canutus rufa*) typically nests in Canada north of the Arctic Circle. The primary wintering area for this species includes South America, but it is known to winter in smaller numbers in Florida (NatureServe, 2013). This species is a shorebird that prefers intertidal, marine habitats. This type of habitat is not present on HARB; therefore, the red knot would not be likely to occur on-base. However, the species is occasionally documented on HARB following storms when water levels are elevated (Friers, personal communication). The red knot is also protected under the MBTA.

Florida Panther

The endangered Florida panther (*Puma concolor coryi*) often occur in association with a wide variety of vegetation, but prefer mature hardwood hammocks and pine flatwoods. Although there have been a few confirmed sightings several miles to the south of the base, the largest contiguous tract of panther habitat near HARB is the Big Cypress Swamp/Everglades region. Agricultural areas and other disturbed habitats are usually avoided, but pasture lands may be traversed at night (USFWS, 1999). In the 1980s, radio-collared panthers were tracked within 1 mile of HARB. However, their appearance at HARB is unlikely, as the base does not contain appropriate habitat for the panther and the adjacent lands are primarily commercial nurseries that are generally unsuitable to the panther for navigating to other areas.

West Indian Manatee

The federally endangered West Indian manatee (*Trichechus manatus*) inhabits coastal and inland waterways throughout Florida's east coast. Manatees require access to aquatic vegetation, freshwater sources, and at least 2 meters of water depths. Biscayne Bay supports a year-round population, with greater numbers occurring during the winter (USFWS, 1999). Near HARB, there have been numerous observations of manatees in and near Black Creek (about 3 miles north of Military and Mowry Canals) and Convoy Point (about 2 miles south of Military Canal). Three manatee sightings also occurred near Military Canal between 1989 and 1994 (USAF and FAA, 2000).

Manatees are regularly observed in the Military Canal and travel as far as the HARB stormwater pump during the winter.

Florida Bonneted Bat

This federally endangered Florida bonneted bat (*Eumops floridanus)* is confined to a small range in south Florida where it prefers to roost in old trees with suitable cavities, but also roosts in Spanish tile roofs. The Florida bonneted bat may also colonize newly installed bat houses of appropriate design. A bat survey recently conducted on a parcel adjacent to HARB detected the Florida bonneted bat. In late 2015, a female Florida bonneted bat mortality was discovered on the HARB airfield. A necropsy conducted by Zoo Miami concluded the cause of death to be blunt trauma but did not speculate causes (Appendix G). An acoustic bat survey is proposed for 2016 to determine the extent of the species' presence on the base.

Specific Florida bonneted bat BMPs have been outlined in the Florida bonneted bat management plan (Appendix G). HARB will implement the BMPs as funding and Air Force regulations allow. Following the proposed bat survey, HARB will consult with USFWS and add appropriate conservation measures to the INRMP.

Florida Bristle Fern

The proposed endangered species Florida bristle fern (*Trichomanes punctatum* spp. *floridanum*) typically occurs on deeply shaded trunks and usually in limestone sinks or on rocks in hammocks (NatureServe, 2013). This species could occur on HARB, but it has not been observed in vegetation surveys.

Blodgett's Silverbush

The candidate species Blodgett's silverbush (*Argythamnia blodgettii*) typically occurs in low, moist limestone areas near margins of pine rocklands. This species also occurs in sunny edges and gaps in pine rocklands, rockland hammocks, and coastal berms (NatureServe, 2013). This species could occur on HARB and would mainly be associated with existing or restored pine rockland habitat.

Florida Brickell-bush

The endangered Florida brickell-bush (*Brickellia mosieri*) occurs on drier soils of pine rockland habitat. This species is only known from the Miami Rock Ridge in Miami-Dade County (NatureServe, 2013). Although the species could occur in existing or restored pine rockland habitat, due to its limited distribution it is unlikely that this species would occur on HARB.

Small's Milkpea

Small's milkpea (*Galactia smallii*) is a federally endangered plant endemic to the pine rockland habitat occurring in Miami-Dade County. The plant was listed as federally endangered on July 18, 1985 due to the extensive loss of pine rockland habitat. No critical habitat has been designated for the species. Small's milkpea is also listed as endangered in the state of Florida (USFWS, 1999).

Small's milkpea is a small, low-growing plant in the bean family with small flowers. The stems trail along the ground for up to 2 meters (m) (approximately 6.6 feet) and appear grayish in color due to a covering of short hairs. The leaves consist of three leaflets that are broadly ovate to elliptic, 1 to 2.2 centimeters (cm) (approximately 0.4 to 0.9 inch) in length, and occur alternating along the stem. The undersides of the leaves have long, soft, wavy hairs lying almost flat against the surface. The upper surface of the leaves is hairless or has sparse, stiff hairs that lie flat against the surface. The flowers are in clusters of 1 to 5 flowers that are 2 to 6 cm (approximately 0.8 to 2.4 inches) in length. Individual flowers are 11 to 12 mm (approximately 0.4 to 0.5 inch) long and pinkish purple or lavender. The fruit is contained in a narrow hairy pod that is approximately 3 to 4 cm in length and 4 mm in thickness (approximately 1.2 to 1.6 inches by 0.2 inch). Small's milkpea is a perennial plant that will regrow for multiple years in addition to growing from seed (description derived from USFWS, 1999; Bradley and Possley, 2002). A scientific description of the Small's milkpea is included in the PPMP (Appendix E).

Small's milkpea typically flowers during the dry summer months, but may flower throughout the year. Small's milkpea may produce fruit throughout the year, and seeds are dispersed from an explosive, spontaneous opening of seed pods. Most flowers do not produce fruit. Flowering may be intensified and synchronized following a burn, and seeds germinate in response to fire. Three

species of bees, one species of wasp, and the Cassius blue butterfly (Leptotes cassius theonus) are the primary pollinators of the Small's milkpea (USFWS, 1999; Bradley and Possley, 2002). The preferred pine rockland habitat of Small's milkpea is characterized by a slash pine canopy with a saw palmetto, wax myrtle (*Myrica cerifera*), poisonwood, and willow bustic (*Sideroxylon salicifolium*) shrub layer. Small's milkpea may also be found with crimson bluestem (*Schizachyrium sanguineum* var. *sanguineum*), wire bluestem (*Andropogon gracilis*), scaleleaf aster (*Symphyotrichum adnatum*), and bastard copperleaf (*Acalypha chamaedrifolia*). Small's milkpea is more abundant in Cardsound rock outcrop complex soils with little quartz sand and prefers open sun with little shade (USFWS, 1999; Bradley and Possley, 2002). This species has been observed on HARB and is also known to occur in maintained areas planted with zoysia. Zoysia is a non-native, low-maintenance grass that is drought tolerant and has a low growth habit. Zoysia is widely used in landscaping at HARB and throughout south Florida.

Sand Flax

Sand flax (*Linum arenicola*) is a federal candidate species and a state endangered species endemic to Miami-Dade and Monroe Counties in south Florida. Sand flax occurs in pine rockland, disturbed pine rockland, marl prairie, and roadsides on rocky soils. The plant is threatened primarily by extensive development, exotic invasive plants, and lack of controlled fire (Bradley and Gann, 1999).

Sand flax is a perennial herbaceous plant with smooth stems and small yellow flowers. The flowers open early in the day and typically have withered by mid-morning. The stems are wiry and grow to 35 to 53 cm (approximately 13.8 to 20.9 inches). The leaves are narrow and unlobed, 7 to 10 mm (approximately 0.3 to 0.4 inch) in length and 0.6 to 1 mm (approximately 0.02 to 0.04 inch) wide. The leaves typically alternate along the stem and may have minute glands along their edges. The stipules are glandular and reddish. The flowers occur in generally flat-topped clusters with the central flowers opening in advance of the peripheral flowers on short (2 mm [approximately 0.08 inch]) slender, spreading or ascending branches. The yellow flower petals are larger near their end and the petals are 4.5 to 5.5 mm (approximately 0.18 to 0.22 inch) in length. The small fruits are pear-shaped, 2.1 to 2.5 mm by 2 to 2.3 mm (approximately 0.08 to 0.10 by 0.08 to 0.09 inch), and separate into 10 segments when mature (description derived from Bradley and Gann, 1999). A scientific description of the sand flax is included in the PPMP (Appendix E).

Sand flax typically flowers and produces fruit from March through November. The petals fall shortly after the flowers open in the morning (FNAI, 2000). Sand flax grows on oolitic limestone formations in pine rockland, marl prairie, and disturbed areas. Preferred habitat is characterized by slash pine canopy with a shrub understory of saw palmetto, wax myrtle, poisonwood, and willow bustic. Several palm species including the Florida thatch palm (*Thrinax radiata*), Key thatch palm, and sliver palm (state-threatened) may occur in the shrub understory along with several hardwood species such as locust berry, longstalked stopper, and smooth devilsclaws (*Pisonia rotundata*). Sand flax is often associated with crimson bluestem, wire bluestem, scaleleaf aster, bastard copperleaf, silver dwarf morning-glory (*Evolvulus sericeus*), and eyebright ayenia (*Ayenia euphrasiifolia*). Sand flax may also occur with other rare herbaceous species such as Carter's small-flowered flax, which also is proposed for listing under the ESA), Blodgett's wild-mercury (*Argythamnia blodgettii*), wedge sandmat (*Chamaesyce deltoidea* spp. *serpyllum*), Big Pine partridge pea (*Chamaescrista lineata* var. *keyensis*), and Mexican alvaradoa (*Alvaradoa amorphoides*) (Bradley and Gann, 1999). This species is known to occur on HARB.

Carter's Small-flowered Flax

The endangered Carter's small-flowered flax (*Linum carteri carteri*) typically occurs in disturbed edges of pine rocklands. Only eight populations of this species are known, half of which have likely been extirpated due to urban development. This species is intolerant of shading and of pine litter accumulation and is likely now restricted to human-disturbed areas due to fire suppression (NatureServe, 2013). Although the species could occur in existing or restored pine rockland habitat, due to its limited distribution it is unlikely that this species would occur on HARB.

Garber's Spurge

The threatened Garber's spurge (*Chamaesyce garberi*) typically occurs in dry, sandy soils in ecotones between hammocks and pinelands or coastal hammocks and sea-oat dunes (NatureServe, 2013). It is unlikely that this species would occur on HARB due to a lack of suitable habitat.

Florida Pineland Crabgrass

The candidate species Florida pineland crabgrass (*Digitaria pauciflora*) is only known to occur at one site within the Everglades National Park. The preferred habitat of this species includes pine rocklands and the open ecotone between grassy marl prairie and pine rockland communities (NatureServe, 2013). It is unlikely that this species would occur on HARB, as it has not been observed in pine rockland habitat vegetation surveys on the installation or on adjoining properties.

Deltoid Spurge

The endangered deltoid spurge (*Chamaesyce deltoidea* spp. *deltoidea*) is endemic to a narrow range of pine rocklands on the Miami Ridge (NatureServe, 2013). The species was allegedly identified within HARB in the early 1900s. However, populations have not been mapped within the installation boundaries or on adjoining properties. It is unlikely that the deltoid spurge would occur on HARB.

Okeechobee Gourd

The endangered Okeechobee gourd (*Cucurbita okeechobeensis* spp. *okeechobeenis*) is only known to occur at a few sites on the shore of Lake Okeechobee. Historically this species was found in swampy forests and hammocks on muck soils, and is now restricted to disturbed areas that are not cultivated, such as ditch banks and wet road shoulders (NatureServe, 2013). It is highly unlikely that this species would occur on HARB due to a lack of suitable habitat.

Beach Jacquemontia

The endangered beach jacquemontia (*Jacquemontia reclinata*) typically occurs in pine rocklands and on the crest and lee side of coastal dunes. It is unlikely that this species would occur on HARB, as it has not been observed in pine rockland habitat vegetation surveys on the installation or on adjoining properties.

Tiny Polygala

The endangered tiny polygala (*Polygala smallii*) is endemic to the southern portion of Florida's Atlantic Coastal Ridge and typically occurs in open grassy pineland, sandy pine rockland,

scrubby flatwoods, and sandhill, often in disturbed areas. This species could occur on HARB, though it has not been observed in vegetation surveys in pine rockland habitat.

Crenulate Lead-plant

The endangered crenulate lead-plant (*Amorpha crenulata*) typically occurs in pine rocklands. Only four populations of this species are known (NatureServe, 2013). The species has not been observed on HARB and due to the isolation of its remaining populations, is unlikely to occur on HARB.

Pineland Sandmat

The candidate species pineland sandmat (*Chamaesyce deltoidea pinetorum*) is only known from the southern portion of the Miami Rock Ridge in southern Miami-Dade County. This species only occurs in pine rocklands habitat (NatureServe, 2013). This species could occur on HARB, but would be unlikely as it has not been observed in vegetation surveys in pine rockland habitat.

Cape Sable Thoroughwort

The endangered Cape Sable thoroughwort (*Chromolaena frustrata*) typically occurs on coastal rock barrens and berms and sunny edges of rockland hammocks (NatureServe, 2013). It is highly unlikely that this species would occur on HARB.

Florida Prairie-clover

The candidate species Florida prairie-clover (*Dalea carthagenensis floridana*) typically occurs in pine rocklands, edges of rockland hammocks, coastal uplands, and marl prairie (NatureServe, 2013). This species could occur on HARB within the pine rockland habitat.

Florida Semaphore Cactus

The endangered Florida semaphore cactus (*Consolea corallicola*) has only one known natural and one recently planted population in the Florida Keys. It occurs on bare rocks with a slight covering of humus in hardwood hammocks near sea level (NatureServe, 2013). It is highly unlikely that this species would occur on HARB.

Everglades Bully

The candidate species Everglades bully (*Sideroxylon reclinatum* spp. *austrofloridense*) has a narrow range, occurring in sensitive and highly fragmented pine rocklands of south Florida (NatureServe, 2013). It is unlikely that this species would occur on HARB, as it has not been observed in pine rockland habitat vegetation surveys on the installation or on adjoining properties.

5.4.2 State-Listed Species

In addition to the federally protected species known to occur in Miami-Dade County, the State of Florida also provides protection for other flora in the county. State-listed plants are categorized as endangered, threatened, or commercially exploited, and are protected under the jurisdiction of the Florida Department of Agriculture and Consumer Services (Chapter 5B-40, F.A.C.). There are 88 endangered and 20 threatened state protected species in Miami-Dade County (Appendix E and H).

Of the over 100 state-protected T&E species in Miami-Dade County, 30 have been known to occur or historically known to occur on HARB and generally have been found throughout the

natural communities on HARB (Table 5-2). However, many of the communities have become overrun with exotic species and no longer support suitable habitat for these state-protected species. For species protected by state law, installations are not required to provide conservation measures similar to those required by the ESA; however, protection measures should be adopted when not in conflict with the military mission. The HARB INRMP outlines measures that can be taken to protect and conserve these state-protected species where practicable.

The potential for the remaining natural communities on HARB to support the state-listed species has been ranked according to general habitat preferences and past surveys on the base. Some plants found in previous surveys were assumed to have "high" potential to occur on HARB, whether or not more recent surveys confirmed their occurrence on the base (Appendix H). Some other state-protected plants have habitat preferences similar to those of natural communities remaining on HARB but have not been documented on HARB according to the last 15 years of survey results; those species are considered to have a "medium" potential to occur on the base. If a species is believed to be extirpated from Miami-Dade County or is limited to a natural community not present on HARB, such species have a "low" potential to occur as remnant communities on HARB.

The habitat requirements of state-protected T&E plants believed to have been or are currently known to exist in Miami-Dade County are summarized in the Appendix H tables. Information on these rare species was obtained from FNAI (2013), NatureServe (2013), Wunderlin and Hansen (2011), and the Leon Levy Native Plant Preserve (2013) but plant descriptions are not always comprehensive and can be difficult to determine because Florida does not have a single comprehensive manual covering the flora of the entire state. The distributions of these plant species also can be found in Wunderlin and Hansen (2011). Recently, the FNAI published the *Field Guide to the Rare Plants of Florida* (FNAI, 2013), which is the first guide that provides identification, habitat information, and management information for more than 200 of Florida's rare plant species.

The remaining natural communities on HARB could potentially support some of the state-designated species if appropriate habitat restoration and continued maintenance to control invasive exotics occurs. Since many of these species have likely been extirpated from the base and surrounding areas, any reintroduction likely would need to include active planting and reseeding efforts. If suitable sites can be found, it is possible that some of these state-protected plant species could be reestablished in new areas.

Protected plants that prefer certain habitats such as the pine rocklands, hammocks, and wetland marshes could occur on the remnant natural communities on HARB. Some of these state-protected species are grown commercially and could be reintroduced in appropriate areas. Information on the cultivation of these species is available from the University of Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences.

TABLE 5-2
State Listed Plant Species Known to Occur and Historically Known to Occur at HARB
HARB Integrated Natural Resources Management Plan

	Administrative Industrial Supp Area	Airfield	Grenade Range and Reserves	Hush House	Munitions Area	Northeast Grasslands	Operable Unit 2	Phantom Lake and Old Grenade Range	Remnant Pine Rockland	Southeast Triangle	Southwest Clear	Twin Lakes and Wetland Fringe	Wetland Marsh
Angadenia berteroi (pineland golden trumpet)	X	X	X		X	X	X		X				
Bletia purpurea (pine pink orchid)	X	X			X				X		X		
Byrsonima lucida (locust berry)	X	X	X	X	X	X		X	X		X	X	
Chamaesyce porteriana (Porter's spurge)	X		X	X		X		X	X		X	X	
Chaptalia albicans (White sunbonnets)	X	X	X		X	X			X		X		
Chrysophyllum oliviforme (satin leaf)								X					
Coccothrinax argentata (silver palm)	X								X		X		
Crossopetalum ilicifolium (Christmas berry)	X	X	X	X	X	X		X	X		X		X
Cynanchum blodgettii (Blodgett's swallowwort)		X			X				X				
Ilex krugiana (Krug's holly)	X		X					X					
Ipomoea microdactyla (Wild potato morning glory)	X				X	X			X		X		X
Jacquemontia curtisii (Pineland clustervine)	X	X	X	X	X	X		X	X		X		
Lantana depressa (Florida lantana)	X					X		X	X		X		
Linum carteri (Everglades flax/Carter's small-flowered flax)			X										
Melanthera parvifolia (small-leaved melanthera)	X	X	X	X		X		X	X		X	X	X
Odontosoria clavata (Wedgelet fern)	X		X					X	X				
Phyla stoechadifolia (Southern fogfruit)	X						X		X				
Poinsettia pinetorum (Everglades poinsettia/rockland painted leaf)									X		X		
Psidium longipes (Long-stalked stopper)	X	X			X	X			X		X		
Pteris bahamensis (Bahama ladder brake fern)	X	X	X		X	X		X	X		X	X	X
Rhynchosia parvifolia (Small-leaf snoutbean)									X				
Scutellaria havanensis (Havana skullcap)	X	X				X		X	X				
Selaginella armata var. *eatonii* (Eaton's spike-moss)	X	X	X		X				X		X		
Senna mexicana var. *chapmanii* (Bahama senna)	X	X	X		X				X		X		
Smilax havanensis (Everglades greenbrier)	X	X			X				X		X		
Spermacoce terminalis (Everglades false buttonweed)	X	X			X	X			X		X		
Stylosanthes calcicola (Everglades key pencilflower)	X	X			X	X			X		X		
Swietenia mahagoni (mahogany)	X		X						X				
Tetrazygia bicolor (tetrazygia)	X	X	X		X	X		X	X		X		
Tragia saxicola (rocklands noseburn)									X				

Sources: IRC and URS, 2013; Golder 2012a; USAF and FAA, 2000; HARB, 2002a

Eight threatened and 15 state species of special concern (SSC) wildlife are known to occur in Miami-Dade County. The table in Appendix H lists their habitat preferences and whether the habitat on HARB could potentially support these species. Of the state-protected wildlife in Miami-Dade County, 10 are known to occur on HARB; of these, 2 are threatened and 8 are SSC (Table 5-3).

TABLE 5-3
State-Listed Wildlife Species Recently Known to Occur on Homestead Air Reserve Base, Homestead, Florida
HARB Integrated Natural Resources Management Plan

Common Name	Species Name
	Birds
Limpkin	*Aramus guarauna*
Little blue heron	*Egretta caerulea*
Reddish egret	*Egretta rufescens*
Snowy egret	*Egretta thula*
Tricolored heron	*Egretta tricolor*
White ibis	*Eudocimus albus*
Southeastern American kestrel	*Falco sparverius paulus*
Florida burrowing owl	*Athene cunicularia floridana*
Least tern	*Sterna antillarum*
Black skimmer	*Rynchops niger*
Brown pelican	*Pelecanus occidentalis*
	Reptiles
American alligator	*Alligator mississippiensis*

Birds

Wetland, pond, and ditch habitats are utilized by wading birds for foraging and other life history requirements. The roseate spoonbill (*Platalea ajaja*) forages for small fish in shallow marine, brackish, or freshwater sites. Little blue heron, reddish egret, and snowy egret usually feed in flocks with other waders in a wide variety of shallow marshes, edges of swamps or ponds, flooded ditches, or stream banks. Tricolored heron and white ibis use both coastal and inland habitats for nesting and foraging.

Many south Florida wading birds are year-round residents or are common on the base. These include the snowy egret, least tern, and white ibis. Others are more sensitive to human activity (e.g. reddish egret) and can be found in undisturbed areas of the base or are less common but do occur on HARB (e.g. little blue heron and tricolored heron). All of these bird species are also federally protected under the MBTA.

The American oystercatcher (*Haematopus palliates*) is a solitary ground nester that prefers to nest on sandy, pebbly beaches or on the borders of salt marshes. The oystercatcher forages in shallow water by using its bill to probe mud below the surface and feeds almost exclusively on shellfish and marine invertebrates (Rattner et al., 2002). HARB is unlikely to provide appropriate habitat or feeding areas for the American oystercatcher, and the species has not been observed on the installation (Friers, personal communication).

Brown pelicans (*Pelecanus occidentalis*) prefer to nest on small coastal islands that provide protection from mammal predators, especially raccoons, and offer sufficient elevation to prevent flooding of nests. Feeding occurs primarily in shallow estuarine waters (USFWS, 1994). The

brown pelican is an occasional transient in the area and has been observed flying over HARB but is not known to nest or feed on the installation (Friers, personal communication).

The black skimmer (*Rynchops niger*) is a colonial species that often nests with other terns. It breeds and forages in estuaries, with nests typically constructed in open spaces on beaches, salt marshes, and dredge spoil islands. The black skimmer feeds by skimming the water for fish (Rattner et al., 2002). HARB does not provide appropriate nesting habitat or feeding areas for the black skimmer, and the species has been observed on the installation (Friers, personal communication).

Limpkins (*Aramus guarauna*) feed in shallow waters and occur near slow-moving freshwater rivers and streams, marshes, and lakeshores. Limpkins largely feed on apple snails and other snails, as well as freshwater mussels, and to a lesser extent lizards, insects, frogs, worms, and crustaceans (Kale, 1978). HARB provides suitable habitat for the limpkin and a few are seen each year (Friers, personal communication).

The natural habitat of the least tern (*Sterna antillarum*) is open, flat beach with coarse sand or shell, usually seaward or within the foredune vegetation. However, the species is opportunistic and will use any gravely or sandy area that is devoid of vegetation and provides suitable habitat, such as spoil islands, parking lots, bridge or building construction sites, and temporary landfills. The least tern is observed seasonally at HARB and has nested on the installation (Friers, personal communication).

The roseate tern (*Sterna dougallii dougallii*) is a migratory, marine bird that forages in the nearshore surf, and is similar in appearance to other tern species. The preferred nesting habitat is open, sandy beach isolated from human activity and predators, although rooftops are also used. Roseate terns have been known to nest on rooftops with the least tern (Gude, 2002). This species is also protected under the MBTA. Occasional transients may occur at Biscayne Bay, but they occur very infrequently there and would be even less frequent as a transient on HARB (USAF and FAA, 2000). According to BASH personnel, no roseate terns have been seen on HARB during bird management activities (Friers, personal communication).

The Florida burrowing owl (*Athene cunicularia floridana*) is a small, distinctive, ground-dwelling bird with long legs, a white chin stripe, round head, and stubby tail. The burrowing owl is also protected under the MBTA. Although intensive cultivation and development of grasslands pose significant threats to the population, studies have shown that owls appear to prefer disturbed sites, with the largest concentrations of owls residing in disturbed grasslands and lawns of residential and industrial areas (FNAI, 2001). Florida burrowing owls are known to occur in groups on HARB at several different perennial nesting sites near the runway in the area of the control tower (USAF and FAA, 2000) and along Flightline Road, within the Munitions Area, and in grassy lawns near administrative buildings (HARB, 2002a).

The Southeastern American kestrel (*Falco sparverius paulus*) inhabits mostly open pine forests and clearings with snags. The decrease of isolated or scattered pine snags in open habitats used by Southeastern American kestrels has been closely correlated with the decline in the number of breeding pairs. Nest boxes can be used in areas of declining availability of natural cavities (United States Department of Agriculture [USDA], 2002). The Southeastern American kestrel is common on HARB during the winter migratory months (Friers, personal communication) and it is protected under the MBTA.

The habitat of the Florida sandhill crane (*Grus canadensis pratensis*) includes freshwater marshes dominated by pickerelweed (*Pontederia cordata*) and maidencane (*Panicum hemitomon).* These birds also require upland forests and grasslands and often eat seeds, leaves, and roots of various plants. The Florida sandhill crane has been seen flying over the base, but is not known to forage or nest there (Friers, personal communication).

White-crowned pigeons (*Columba leucocephala*) nest only in extreme south Florida, mainly in mangrove forests. These birds move inland daily to feed on poisonwood fruits. In addition, they eat strangler fig, mastic, pigeon plum, sea grape, and other tropical fruits, plus seeds and insects (Kale, 1978). This species is also protected under the MBTA. The white-crowned pigeon has been rarely observed on HARB, indicating that it likely is an occasional transient species. However, the species could nest in the hardwoods on the installation (Friers, personal communication).

Mammals

Southern mink (*Mustela vison*) occur in a wide variety of plant communities, but are associated with water rather than with particular habitat types. They most often occur in coniferous and mixed forests and in grassland environments if open water or marshland is present (Allen, 1986). They are primarily nocturnal hunters that feed on small mammals, insects, birds, fish, crayfish, and snails (Rattner et al., 2002). Only the Everglades mink population is listed by the state as threatened. This subgroup has a disjunct distribution in south Florida with one population near Lake Okeechobee and another in the Big Cypress Swamp-Everglades National Park area (Sullivan, 1996). While marginally suitable habitat is available for the Everglades mink on HARB, it has never been observed there and there have been no observations of signs (i.e., tracks or dens) on HARB. This species is unlikely to occur on HARB.

The Florida mastiff bat (*Eumops glaucinus floridanus*) occurs in urban residential areas of Miami, Coconut Grove, and Coral Gables. It typically occurs in buildings, low shrubbery, and among lush growths of tropical flowers and shrubs. A favored roosting place in Miami is under the shingles of Spanish tile, but they have been observed in royal palm leaves in Coral Gables (Best et al., 1997). The Florida mastiff bat has also been documented in the general Homestead area and may occur at HARB. A bat survey is proposed to determine if the species is present on the base.

The Florida mouse (*Podomys floridanus*) occurs in xeric upland communities with sandy soils, including scrub sandhill and ruderal sites where they inhabit burrows of the gopher tortoise. In the absence of gopher tortoises, the mice will dig their own burrows or use those of oldfield mice (*Peromyscus polionotus*). HARB lacks suitable habitat to support the Florida mouse.

Florida black bears (*Ursus americanus floridanus*) use a wide variety of forest types: pine flatwoods, hardwood swamp, cypress swamp, hammocks, xeric oak scrub, and mixed hardwood-pine, although seasonal changes in habitat use occur in response to food availability. Historically, Florida black bear occurred throughout the Florida mainland and on some coastal islands, often associated with large forested tracts. The black bear is widespread in Florida, but its distribution has been reduced and its habitat fragmented (Kale, 1978). HARB lacks suitable habitat to support the Florida black bear.

Fish

The mangrove rivulus (*Rivulus marmoratus*) usually occurs in areas adjacent to mangrove swamps and high salt marshes and uses the burrows of land crabs (*Cardisoma* sp.) and other crab

species (Gilbert, 1992). Because of its habitat preferences for crab burrows adjacent to coastal areas and the saltwater barrier on Military Canal, the canal system and lakes on HARB are not suitable to support the mangrove rivulus.

Reptiles and Amphibians

The Florida pine snake (*Pituophis melanoleucus mugitus*) prefers open, sandy areas and often is found in association with pocket gophers and gopher tortoises (Moler, 1992). Based on the lack of gopher tortoises on HARB, the Florida pine snake is not expected to occur on the base, but the pine rockland area could provide appropriate habitat.

The American alligator has responded favorably to protection efforts but was reclassified as threatened because of its similarity in appearance to the American crocodile in 1985. In 1987, the State of Florida introduced managed harvests of alligators and their eggs to create conservation incentives by enhancing the economic value of wild alligator (LaRoe et al., 1995). The canals and lakes on HARB provide habitat for American alligators and they are known to occur here. A *Caiman Removal Feasibility Study* was conducted at HARB in 2012 (AMEC, 2012). The study identified a total of 16 American alligators and two American crocodiles. The American alligators were observed in the Boundary Canal, Phantom Lake, Twin Lakes, and in the Military Canal stormwater reservoir. The American crocodiles were observed in Phantom Lake and Twin Lakes.

Rim rock crowned snakes (*Tantilla ooltica*) typically occur in sandy and rocky soils in slash pine flatwoods, tropical hardwood hammocks, and vacant lots and pastures with shrubby growth and scattered slash pines (Moler, 1992). The rim rock crowned snake has not been recorded on HARB during species-specific surveys (USAF and FAA, 2000). However, these surveys did not appear to include the pine rockland site, which also would provide appropriate habitat. Given the limited acreage of habitat available, it is possible, but considered unlikely, that the Remnant Pine Rockland habitat on the base could support the rim rock crowned snake.

5.5 Exotic and Invasive Species

In June and July 2004, a series of surveys was conducted on HARB to collect information regarding invasive and non-native plant and vertebrate species. The purpose of the surveys was to develop an invasive and non-native plant and animal management plan for the base. The results of the survey indicate that there were 22 invasive and nonnative species on HARB and 12 Florida Exotic Pest Plant Council Category I species. In addition, 16 non-native and 2 nuisance animal species were found on HARB (e^2M, Inc, 2005b). The results are summarized in Appendix H.

The Everglades Cooperative Invasive Species Management Area (ECISMA) is a formal partnership between the SFWMD, FFWCC, USFWS, NPS, and U.S. Army Corps of Engineers (USACE), that manage invasive species within Everglades National Park. The ECISMA maintains lists of introduced and exotic plants, mammals, birds, reptiles, amphibians, fish, insects, mollusks, crustaceans, and arachnid species that occur in Everglades National Park. These lists can be accessed through the ECISMA website (http://www.evergladescisma.org/species/).

5.5.1 Exotic and Invasive Wildlife

Like many other places in south Florida, the natural communities on HARB provide habitat for an assortment of exotic, invasive wildlife species, including reptiles, amphibians, and birds.

These animals often out-compete native species and modify habitats to the detriment of native wildlife. The most damaging exotic animal species on the base include spectacled caiman, Nile monitor lizard, and several exotic fish species that are described in the following subsections. Additional exotic animal species that occur in south Florida and are known to occur or potentially occur at HARB are also described in the following subsections.

The spectacled caiman is present throughout the canals and lakes of HARB. It was originally imported into the United States by the pet trade industry (King and Krakauer, 1966) and free-living caimans were observed as early as the late 1950s in the Miami area. In 1974, a breeding population was discovered within Homestead AFB and by 1980 caimans were reported to have become naturalized from Seminole County to Miami-Dade County. The spectacled caiman is considered established and relatively common, especially in drainage canals of south Florida and efforts to extirpate the species have been unsuccessful (Ellis, 1980). The caiman can maintain viable populations in disturbed areas and it out-competes alligators and crocodiles, negatively affecting their populations. This species is of particular concern since it has adapted well to conditions in south Florida, and has the potential to further impact the regional fauna. Extirpation effort of the caiman populations at HARB began in 1977, but the caimans are still present on the installation and likely breeding.

A *Caiman Removal Feasibility Study* was conducted at HARB in 2012 (AMEC, 2012). The study identified a total of four spectacled caimans. Three of the caimans were found in a vegetated portion of the Boundary Canal in the southeast area of HARB. The forth individual was observed in Phantom Lake. All four were removed. No crocodilian species were observed in the Military Canal or flight line canals.

In recent years, Nile monitor lizards have been sighted on HARB along canal levees and drainage canals in the southern and northern portions of the Boundary Canal system. The Nile monitor lizard also has become established in the Fort Myers and West Palm Beach areas, and has been sighted in the Florida Keys (e.g., Grassy Key). The species is becoming more common in drainage canals, which are a preferred means of travel. The NPS has been working with the HARB BASH representative to prevent the establishment of a viable population on-base. Like the caiman, this species is of particular concern since it has adapted well to conditions in south Florida, and has the potential to further impact the regional fauna.

Cuban tree frogs (*Osteopilus septentrionalis*) are believed to have been introduced into Florida in 1931 in cargo from Cuba. Since then, they have spread to 27 counties in Florida and are known to prey on many native frog species, including the southern toad (*Bufo terrestris*), the narrow-mouthed toad (*Gastrophryne carolinensis*), the southern leopard frog (*Lithobates [Rana] sphenocephala*), the green treefrog (*Hyla cinerea*), and the squirrel treefrog (*Hyla squirella*). Cuban tree frogs are attracted to the buzzing noise of electrical transformers and these frogs have climbed into and short-circuited transformers, causing localized blackouts (Fuller and Benson, 2013).

Basilisk lizards (*Basiliscus vittatus*) typically occur in low-density suburban developments, peripheral to core urban areas, agricultural habitat, and recently disturbed areas. They occur along the canals in Miami-Dade County (Butterfield et al., 1997) and have been reported at a number of locations on HARB (USAF and FAA, 2000).

Green iguanas (*Iguana iguana*) are popular pets that are frequently released or escape. They have occurred on Key Biscayne and in urban and suburban areas elsewhere in south Florida,

especially where trees form dense canopies near water (Dalrymple, 1994). They regularly occur on HARB (AECOM, 2009), especially along canals.

The Argentine black and white tegu (*Tupinambis merianae*) is an exotic lizard introduced in Florida. Breeding populations of tegus have been identified in Miami-Dade County and potentially occur on HARB (FFWCC, 2012).

A Burmese python (*Python molurus*) population has established in South Florida, particularly within Everglades National Park. This species also potentially occurs at HARB.

The house sparrow (*Passer domesticus*) and European starling (*Sturnus vulgaris*) are the most common introduced bird species in upland areas of the base. The monk parakeet (*Myiopsitta monachus*) is the most abundant naturalized parrot species in the United States. These birds can build nests in any tall structure, natural or constructed. Monk parakeets were observed in the 1970s at feeders amid flocks of another exotic caged-bird species, the canary-winged parakeet (*Brotogeris versicolurus*; Spreyer and Bucher, 1998). Other exotic avian species that occur on or near the base include the hill myna bird (*Gracula religiosa*), peacock (*Pavo* spp.), and Eurasian collared dove (*Streptopelia decaocto*) (USAF and FAA, 2000).

Several exotic fish species occur on HARB. The Oscar, a South American cichlid established in Florida in the late 1950s as a result of a Miami-Dade County fish farm release, is now a common sport fish (Fuller and Nico, 1999). The spotted tilapia (*Tilapia mariae*), an African cichlid likely introduced into Florida from fish farms in Miami-Dade County during the early 1970s, is now one of the most abundant species in many south Florida canals (Fuller and Nico, 1999). The pike killifish (*Belonesox belizanus*) is native to Central America, but was introduced into south Florida in 1957 when individuals reared for medical research were released into a local canal and is now firmly established. The Mayan cichlid (*Cichlasoma urophthalmus*), blue tilapia (*Oreochromis aureus*), Orinoco sailfin catfish (*Pterygoplichthys multiradiatus*), walking catfish (*Clarias batrachus*), Asian swamp eel (*Monopterus albus*), and other various cichlids are exotic freshwater fish species known to occur on HARB (Appendix H; Gandy & Rehage, 2013).

Triploid grass carp (*Ctenopharyngodon idella*) have been widely stocked throughout Florida to control nuisance aquatic plants. Triploid grass carp are genetically modified to have three sets of chromosomes, instead of two sets, rendering them functionally sterile. Grass carp consume large amounts of aquatic plants and submerged grasses (rooted macrophytes as opposed to algae) and will also eat detritus, insects, and other invertebrates when necessary. Due to their feeding behaviors, triploid grass carp stocking is restricted and by permit only (FFWCC, 2014).

While grass carp control invasive aquatic plants that create problems with access, navigation, flood control, irrigation, and aesthetics, there are concerns for how the species affects aquatic habitat and water quality. The elimination of aquatic vegetation decreases spawning substrate, food, and shelter for certain species of fish. Certain waterfowl species have the same food requirements as grass carp and may experience decreased habitat quality when grass carp are used for aquatic plant control. Amphibian populations may also decline. Grass carp also contribute to increased nutrient-rich excrement in the water, causing increases in plankton blooms. Increased plankton could lead to decreased water quality and eutrophication as well as changes to fish communities. Fish species that consume plankton and fecal matter tend to thrive when grass carp are present. However, studies have shown that limiting the number of grass carp and stocking triploid, sterile individuals have minimal impacts to aquatic habitats and water quality (Pipalova 2006; Cassani, 1995).

5.5.2 Exotic and Invasive Plants

Because of south Florida's tropical climate, invasive and exotic plants are considered one of the greatest threats to the integrity of the area's ecosystem. Non-native species within the base have invaded disturbed areas, displaced native vegetation, disrupted natural functions, reduced available habitat for endemic plants and animals, and created fire hazards due to increased fuel loads. The most damaging exotic plant species on the base include Brazilian pepper, Australian pine, Burma reed, and Napier grass, which are described below (e^2M, Inc, 2005).

Brazilian pepper quickly produces a thick monoculture that eliminates habitat for wildlife and can chemically suppress flowering in other plants. It invades disturbed areas as well as undisturbed natural environments. Brazilian pepper also can cause human health and safety concerns because the plant is related to poison ivy and when in bloom, direct contact with the sap can cause allergic reactions. The seeds are readily eaten and transported by birds and mammals. Control methods include use of heavy mechanical equipment and herbicides. While fire may affect the seeds, seedlings, and saplings, it provides little control for mature trees except during intense fires, which would be detrimental to any nearby native species. Regardless of the control method, follow up is important and treated areas must be checked periodically for any new infestations or re-growth from remaining stumps and seedbanks (Ferriter, 1997).

Australian pines colonize disturbed areas, preventing germination and growth of native plants by shading and producing a thick litter layer. Australian pines also are shallow-rooted and more susceptible to becoming uprooted during hurricanes or high winds. Probably the most efficient and cost-effective method used to remove Australian pine is to cut the tree, then apply an herbicide to the stump. Subsequent treatment of the area by prescribed burning may prevent this fire-sensitive species from reestablishing (e^2M, Inc, 2005).

Exotic grasses develop monocultures that exclude native species. Dense populations of Burma reed and Napier grass are located throughout HARB. These grasses are highly flammable and create both hazards and security issues for the base. Both Napier grass and Burma reed can persist through changing environmental conditions due to their deep, fibrous route system, and they regenerate easily after mechanical control. Burning, by itself, whether through prescribed or natural wildfires, may enhance the growth and spread of Burma reed if not followed up with chemical or mechanical control. Therefore, a more effective approach to removal involves a combination of cutting or prescribed burning, followed by an application of herbicides (e^2M, Inc, 2005).

5.6 Wetlands and Floodplains

5.6.1 Wetlands

Wetlands generally are considered to be transitional zones between the terrestrial and aquatic environment and are characterized by physical, chemical, and biological features indicative of certain hydrological conditions. Currently, the USACE regulates wetlands under Section 404 of the Federal Water Pollution Control Act Amendments of 1972 to the CWA. Jurisdictional wetlands are defined by the USACE as "*…those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and other areas."* (USACE, 1987).

During 2001, federal and state jurisdictional wetland surveys were conducted on HARB (HARB, 2002b). Of the 1,943 acres within HARB, approximately 233.5 acres or 12 percent of the total land area have been identified as jurisdictional wetlands (Figure 4-4). All surveys were conducted in accordance with the USACE wetlands delineation manual (USACE, 1987) and FDEP methods identified in Chapter 62-340, F.A.C.

In general, types of wetlands occurring on the base include wet marsh and wet prairie. The wetland areas are primarily located within the runway infield and southeast of the runway extending in a southwest to northeast direction. Approximately 49 acres or 21 percent of wetlands are within the infield of the taxiway and runway and serve as drainage basins (HARB, 2002b). Specific locations of wetlands on HARB are illustrated in Figure 4-4.

The presence of infield wetlands and wetlands southeast of the runway creates operational concerns on HARB because, in part, they occur within the 1,000-foot primary surface zone. The primary surface zone is measured from the runway centerline to a distance of 1,000 feet on either side of the runway surface (see Figure 5-2; HARB, 2006a). Primary surface zone requirements mandate the need for a graded, solid serviceable surface to establish a safe correction zone for aircraft arriving at and departing from HARB (HARB, 2006a). The wetlands and the rutting of the wetlands from mowing do not provide a solid, uninterrupted surface. In addition, these wetlands contribute to BASH concerns since numerous birds use the wetlands for foraging activities.

Wetlands were evaluated in a 1996 report entitled *Ecological Assessment of Wetlands, Pine Rockland Areas, and Protected Species on the Dade County – Homestead Regional Airport and Homestead Air Reserve Station (Formerly Homestead Air Force Base).* In May and June of 1996, representatives from the SFWMD, Permitting, Environment, and Regulatory Affairs, and the USACE visited HARB to review and approve the extent of state and Federal jurisdiction over wetlands on HARB.

In 2009, a feasibility study was conducted to evaluate potential consequences of removing or altering wetlands on HARB. The study focused on the runway and taxiway infield wetlands and was a result of airfield primary zone surface requirements and the stipulations outlined in the BASH procedure (Appendix C). The study involved a field review of each wetland, documented descriptions of their location, wildlife usage, and vegetative community, and evaluations of the wetlands functional value (AECOM, 2009).

In 2012, an updated jurisdictional wetlands report was produced for HARB that updated the jurisdictional wetlands delineation completed in the early 2000s, evaluated the functional value of wetlands, and examined revisions to local, state, and federal wetland regulations. A field assessment of HARB wetlands was completed on November 16-18, 2011 that included an assessment of wildlife utilization. The information collected was then used to evaluate each wetland. During the field assessment, 14 wetland areas were delineated on HARB. It was noted that these wetlands were primarily herbaceous, with a few forested wetlands located in the southern sections of HARB (AECOM, 2012). The forested wetlands on HARB have since been cut and removed to comply with security force protection measures.

5.6.2 Flood-Prone Areas

Maps issued by the Federal Emergency Management Agency (FEMA) in 2009 indicate that the eastern end of the base, generally running on a north-south axis through the runway, would be flooded from a 100-year flood event (see Figure 4-4; FEMA, 2009). Flooding on HARB most

likely would result from significant periods of heavy rainfall and would less likely be attributed to coastal flooding and storm surges due to the distance from the coast.

It is estimated that Category 1 and 2 hurricanes would not cause inundation of the base, but a Category 3, 4, or 5 hurricane could cause tidal surges ranging from 11 to 16 feet NGVD. Maximum surge height for sustained winds of 145 miles per hour has been estimated at around 8.5 feet (HARB, 2009a).

5.7 Other Natural Resource Information

The *Pine Rockland Baseline Assessment Report* (Golder, 2012a), outlines the baseline assessment for a pine rockland community in the northwestern section of HARB, encompassing approximately 3 acres. The study was conducted as part of an initiative to improve the pine rockland native plant diversity and overall quality of the environment and simultaneously eliminate wildfire and decrease base security hazards. Prior to drafting the report, a comprehensive, quantitative botanical survey was conducted. Rare federally-, state-, and county-listed plant species that are prevalent within pine rockland communities were documented and inventoried. In addition, invasive exotic plant species designated for removal were documented.

The report defines pine rocklands as "sparsely forested, upland communities unique to southernmost Florida, Cuba, and the Bahamas" (Golder, 2012a). In conclusion, the report notes that a *Pine Rockland Restoration and Management Plan* (Golder, 2012b) was completed for the 3-acre study area. Documentation in the survey area revealed that in terms of distribution of species, the pine rockland site on HARB is a homogeneous environment with the exception of areas where dense Australian pine or Burma reed were growing. The slash pine canopy was largely destroyed by winds during Hurricane Andrew and an insect infestation that followed the storm, but a significant group of young and sapling pines survived. Invasive species have colonized and now dominate the site, including Australian pine, Burma reed, and Brazilian pepper. However, native plants typical of pine rockland, including mature and sapling slash pine, poisonwood, willow bustic, rough velvetseed, and white indigo berry, were identified on the site. Several additional state-listed species were also identified, including the Florida clover ash, locust berry, ground lantana (also known as rockland shrub verbena, Florida lantana, and pineland lantana), and pineland jacquemontia. The federal candidate and state-listed sand flax was observed on the eastern side of the study area and a rockland shrub verbena on the western side of the area. Florida clover ash and Everglades greenbrier occur throughout the area while locust berry and pineland jacquemontia were observed on the northern and southern sides of the study area. An edge effect was apparent as more key species were located on the perimeter and in open canopy areas (Golder, 2012a).

A re-assessment of the area revealed that even though herbicide treatment of exotic plants had proved initially successful, some invasive exotics and nuisance species continued to return despite its use. These include muscadine, Virginia creeper, Burma reed, and lead tree. Lead tree was noted as the most prevalent invasive exotic plant species. The report recommends aggressive and regular treatment and removal of these exotic species.

The *Phantom Lake Improvements and Constraints Study* (Golder, 2013a) evaluated natural communities in the vicinity of Phantom Lake within HARB. The purpose of the survey was to verify the potential to enhance and manage habitat conditions for native ecological communities and avoid increased potential for bird strikes. Phantom Lake is within the western, undeveloped area in HARB and, unlike the Twin Lakes, does not have a direct connection to the Boundary Canal. The 14.5-acre man-made lake is essentially rectangular. The water is deeper along the

edge of the lake and shallow towards the center, where a variety of emergent aquatic plants grow. These include: jointed spikerush (*Eleocharis interstincta*), clubrush, southern cat-tail (*Typha domingensis*), and sawgrass (*Cladium mariscus* spp. *jamaicense*). Surrounding Phantom Lake are uplands composed of Remnant Pine Rockland habitat which have been overtaken by invasive exotic plant species.

The report concludes that while the interior portions of Phantom Lake contain emergent hydrophytic vegetation, the coverage and diversity are low when compared to similar environments such as typical Everglades marsh/slough areas. Recommendations for environmental improvement included changes to the surface soil layer and the installation of supplemental vegetation using native marsh species adapted to the hydrologic conditions. The report also recommends herbicide treatment and the removal of cat-tail plants, which dominate other native marsh species.

Bird utilization is noted in the report as relatively low within the Phantom Lake survey area. With few tree islands with native vegetation, wading birds, passerine birds, and shorebirds may not have sufficient access to roosting or foraging habitats. It is not recommended, however, to increase the bird utilization of the area, since Phantom Lake is near the HARB runways, which poses a threat for increased bird strikes. The report also outlines recommendations for habitat improvements for the perimeter uplands as well as enhancements for recreational access and fish populations. The survey revealed that Phantom Lake contained a relatively high number of native game species when compared with other areas at HARB; fish stocking and future coordination with the FFWCC were recommended.

The *Twin Lakes Feasibility Study* (Golder, 2013b) conducted a baseline assessment of the natural communities surrounding and within the Twin Lakes area at HARB. The purpose of this study was to evaluate the floral and faunal communities surrounding and within the Twin Lakes area to determine the potential to enhance and manage native ecological communities and avoid increased potential for bird strikes. The Twin Lakes area is located southeast of the runway and encompasses approximately 16 acres, while the surrounding wetland fringe covers approximately 25 acres. Twin Lakes consists of two deepwater borrow lakes with an emergent wetland fringe dominated by cattail, Burma reed (*Neyraudia reynaudiana*), and sawgrass. The lakes are bordered to the east by a paved access road adjacent to the perimeter Boundary Canal, and to the north, west, and south by emergent marsh wetlands dominated by jointed spikerush, cattail, and muskgrass (*Chara* sp.). The western edge of the southern lake is also partially bordered by a disturbed upland area that appears to be elevated above the surrounding grade due to the placement of limerock fill material. This upland area contains a combination of native and invasive/exotic tree and shrub species including Australian pine (*Casuarina equisetifolia*), white stopper (*Eugenia axillaris*), willow bustic (*Sideroxylon salicifolium*), and false nettle (*Boehmeria cylindrica*). The report presented the following conclusions:

1. Vegetation within the borrow lakes is limited to the narrow (less than 6 ft. wide) littoral edges of the lakes with approximately half of the vegetation consisting of invasive/exotic species.
2. The north, west, and southern edges of Twin Lakes were bordered by emergent marsh with approximately 77 percent coverage by herbaceous species and approximately 33 percent cover by emergent hydrophytes.
3. Predominant herbaceous and woody tree/shrub species within the upland assessment area were the invasive/exotic Australian pine.

4. No listed vegetative species were observed within the littoral and open water zones of lakes, the perimeter marsh areas, or perimeter uplands.
5. Fish species abundance appeared relatively low within the borrow lakes and the littoral edges of the borrow lakes.
6. Wildlife abundance and diversity appeared to be relatively low within the Twin Lakes study area with the majority of wildlife species (including fish species) observed within the shallow marsh areas to the north of the northern borrow lake.

Recommendations for environmental improvement included installation of supplemental vegetation using native marsh species adapted to similar hydrologic conditions, addition of a ±6-inch deep layer of muck/high-organic soil to provide improved anchoring for the installation of supplemental hydrophytes, and herbicide treatment and physical removal of treated cattail and Burma reed. Restoration of previously disturbed marsh habitat around upland areas also was recommended. At Twin Lakes partial or full removal of the berms along the north and west edges of the northern lake to provide a direct surface water connection between the lake and the adjacent marsh areas was recommended to allow the forage fish species from the marsh areas to reach the lake areas and for larger fish species observed within the lake to reach the forage fish. Expansion of the hydrologic connection between the north and south lakes in the upland berm between the lakes also was recommended. Additionally, after consultation with experts, fish stocking could be implemented to improve diversity.

Chapter 6 Mission Impacts on Natural Resources

6.1 Land Use

HARB encompasses 1,943 acres of land in Miami-Dade County, Florida. HARB land use activities are planned and managed to support the base's military mission, which is *"to train and equip reservists to respond to wartime and peacetime tasking as directed by higher headquarters.*" In the broadest sense, there are three basic mission-driven land uses on HARB: (1) the airfield, (2) the ammunition storage area and safety buffer associated with the ESCZ arcs, and (3) the urban/industrialized area (see Figures 5-1 and 5-2). The 14 land management units (see Chapter 5, Figure 5-1) are each subcomponents of these land use categories. The land management units are subject to mission military requirements (i.e., specific needs for readiness, safety, and security), and are managed as such. These requirements present both opportunities and constraints for management of wetland functions, vegetation, and wildlife within these units.

The Administrative and Industrial Support Area and Airfield support land use activities that are essential for accomplishing the base's military mission. This area functions as the urban core of the base and houses two major tenant commands (SOCSOUTH and FANG). It includes aviation support facilities (hangars and maintenance workshops), fuel storage, administrative facilities, and military personnel support facilities, as well as the airfield complex (runway, taxiway, and flightline).

The majority of the land east and south of the runway (including the Wetland Marsh, Hush House, Twin Lakes and Wetland Fringe, and the Southeast Triangle Areas; see Figure 5-1) is open space and wetland. With the exception of the Hush House and Southeast Triangle Areas, wetlands are the predominant land use features. These wetland areas, in part, are used for airfield drainage. The enclosed structures of the Hush House Area reduce noise generated by aircraft engine testing. The Southeast Triangle contains the reservoir and pump house and is the single point for surface water discharge from the base.

The western portion of the base is within the ESCZ arcs and comprises the Munitions, Grenade Range and Reserves, Northeast Grassland, Southwest Clear Zone, and OU-2 areas (see Figures 5-1 and 5-2). Collectively, these areas are largely unimproved. Reserve bivouac training is conducted in the western boundary of the Grenade Range and Reserves Area. Figure 5-2 depicts important constraint factors that HARB uses during decision-making.

6.2 Current Major Impacts

6.2.1 Sources of Water Pollution

Industrial activities occurring at HARB that could contribute to potential stormwater contamination include the following:

- Aircraft Maintenance –Contamination from this source includes runoff from areas where aircraft fluid changes, mechanical repairs, parts cleaning, sanding, refinishing, painting, and washing occur. Areas where these activities are conducted include the aircraft maintenance hangars, engine shop, alert facility, hush houses, aircraft parking aprons, and the fuel cell hangar.
- Aircraft Refueling – Contamination from this source includes runoff from areas associated with aircraft refueling operations. Areas where these activities occur include the POL facility and the aircraft parking aprons.

- Aerospace Ground Equipment (AGE) and Vehicle Maintenance –Contamination from this source includes runoff from areas where AGE and vehicle fluid changes occur. Activities also include mechanical repairs, parts cleaning, sanding, refinishing, painting, washing, and storage of vehicles and equipment waiting for repair or maintenance. Related materials and waste materials such as oil, fuel, batteries, tires, and oil and fuel filters are stored in this area. These activities are conducted at the AGE Shop, Civil Engineering Complex, Vehicle Maintenance and Transportation, and the aircraft parking aprons.
- Equipment and Vehicle Refueling – Contamination from this source includes runoff from areas associated with vehicles and equipment refueling operations. Areas where these activities occur include Vehicle Maintenance and Transportation, AGE Shop, and POL Complex.
- Recycling Facility – Contamination from this source includes runoff from areas associated with the collection, breakdown, sorting, and redistribution of a diversity of materials. Typical materials recycled include: ferrous and non-ferrous metals, glass, plastic, aluminum, cardboard, paper, computers, office furniture, and wood.
- POL spills, including drips, are one of the major stormwater pollution concerns at HARB. Petroleum-based fuels and oils have a variety of hazardous components (e.g., benzene, toluene, xylene, and naphthalene) that could have adverse impacts on receiving water quality in the event of an accidental discharge. Due to the large quantity of jet petroleum-8 aircraft fuel (JP-8) used at the base, it has the greatest potential for stormwater contamination. Large quantities of JP-8 are transferred from tanks at the POL Complex and hydrant fueling stand to refueler trucks, which transport fuel to the flightline for aircraft fueling. Fuel overfill spills from aircraft, refueler trucks, or fuel bowsers can occur on the flightline or in the POL Complex.
- HARB uses a network of oil/water separators, which are control devices used to remove oil, grease, fuel, and other floatable materials from stormwater. These materials are common and could potentially contaminate stormwater at the base. The size and design of these units and the storage capacity of separated materials determines the extent to which the units can remove contaminants. Most oil/water separators at HARB discharge to the sanitary sewer and are not identified as current stormwater BMPs.

6.2.2 Sources of Air Emissions

Stationary air emission source categories at HARB include external combustion sources, internal combustion sources, fuel transfer/dispensing, storage tanks, surface coating operations, degreaser/solvent cleaners, fuel cell maintenance, off-aircraft engine testing, miscellaneous chemical usage, and dust collectors. Major source thresholds have been established to determine the applicability of Title V air permit requirements for these stationary sources of air pollutants. Because annual emissions from these sources are less than the corresponding major source thresholds, HARB is not required to operate under a Title V permit.

According to the annual air emission operating permit, specific air emission sources at HARB include a 55,000-barrel JP-8 aboveground storage tank (AST), a 20,000-barrel JP-8 AST, 2 Torit Division Donaldson Company dust collectors, 3 spray paint booths (each with associated exhaust fans), a small arms Total Containment Trap cartridge dust collection system, and 2 jet engine test facilities (hush houses: one currently active and one inactive).

The use of internal combustion engines, including stationary and portable emergency generators, and the engine test stand contributed to the largest amounts of nitrogen oxides (NO_X), carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter (PM), particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$) and particulate matter less than 10 microns in aerodynamic diameter (PM_{10}). HARB currently utilizes 25 emergency generators, 5 fire suppression pumps, and 3 outflow canal pumps.

6.2.3 Vegetation Management Requirements

Grasses and woody vegetation surrounding the airfield must be mowed and maintained to a certain height to deter nesting and foraging birds in compliance with the BASH program.

6.2.4 Groundwater-Contaminated Sites

The HARB IRP currently includes 18 CERCLA sites, 2 MMRP sites, and 8 POL sites for a total of 28 sites (Figure 6-1). Long-term monitoring for groundwater contamination is ongoing at four CERCLA sites (OU-7, OU-11T, OU-15, and OU-18) and two POL sites (SS-2A and SS-15A). Land use controls have been implemented for 20 of the 28 IRP sites.

6.3 Potential Future Impacts

Recently, USFWS has listed five plant and three animal species as endangered (Cape Sable Thoroughwort, Florida Semaphore Cactus, Aboriginal Prickly-Apple, Carter's Small-flowered Flax, Florida bristle fern, Bartram's hairstreak, Florida leafwing, and Florida bonneted bat) and has designated critical habitat in the vicinity of HARB for other species listed under the ESA (Appendix B—USFWS correspondence). The critical habitat does not extend onto HARB, and HARB has been exempted from critical habitat designation due to implementation and regular update of its INRMP. Florida bonneted bat, Small's milkpea, and sand flax are known to occur on HARB and could be impacted by future activities.

Mission related impacts to Florida bonneted bat will persist primarily in the form of BASH related strikes and disturbance to the species foraging behavior. Because this species has only recently been discovered on HARB, studies are planned to determine the population size and species behavior on the installation. HARB will implement BMP's and work with the USFWS to minimize impacts to Florida bonneted bat and will adapt management as new information is gathered about the species.

Planned remediation activities at IRP sites known to contain populations of Small's milkpea and sand flax could adversely impact these federally protected species. Activities associated with remediation that could impact protected species include clearing, grubbing, filling, and capping of IRP sites, which would likely result in a take of a federally protected species. Consultation with the USFWS would determine required management activities to reduce potential impacts to federally protected species.

6.4 Natural Resources Needed to Support the Military Mission

The Boundary Canal System is needed to support stormwater management at HARB. The Boundary Canal System, as described in Section 4.4.1, is a series of canals at HARB that ultimately discharge to Biscayne Bay. The canal system provides habitat for a variety of aquatic plant and animal species.

6.5 Natural Resources Constraints to Missions and Mission Planning

The large populations of the federally endangered Small's milkpea and federal candidate species sand flax occurring throughout HARB are likely to cause the greatest constraint on potential future development and mission expansion (Appendix E).

The existing wetlands, canal system, and floodplains also have potential to constrain future missions at HARB.

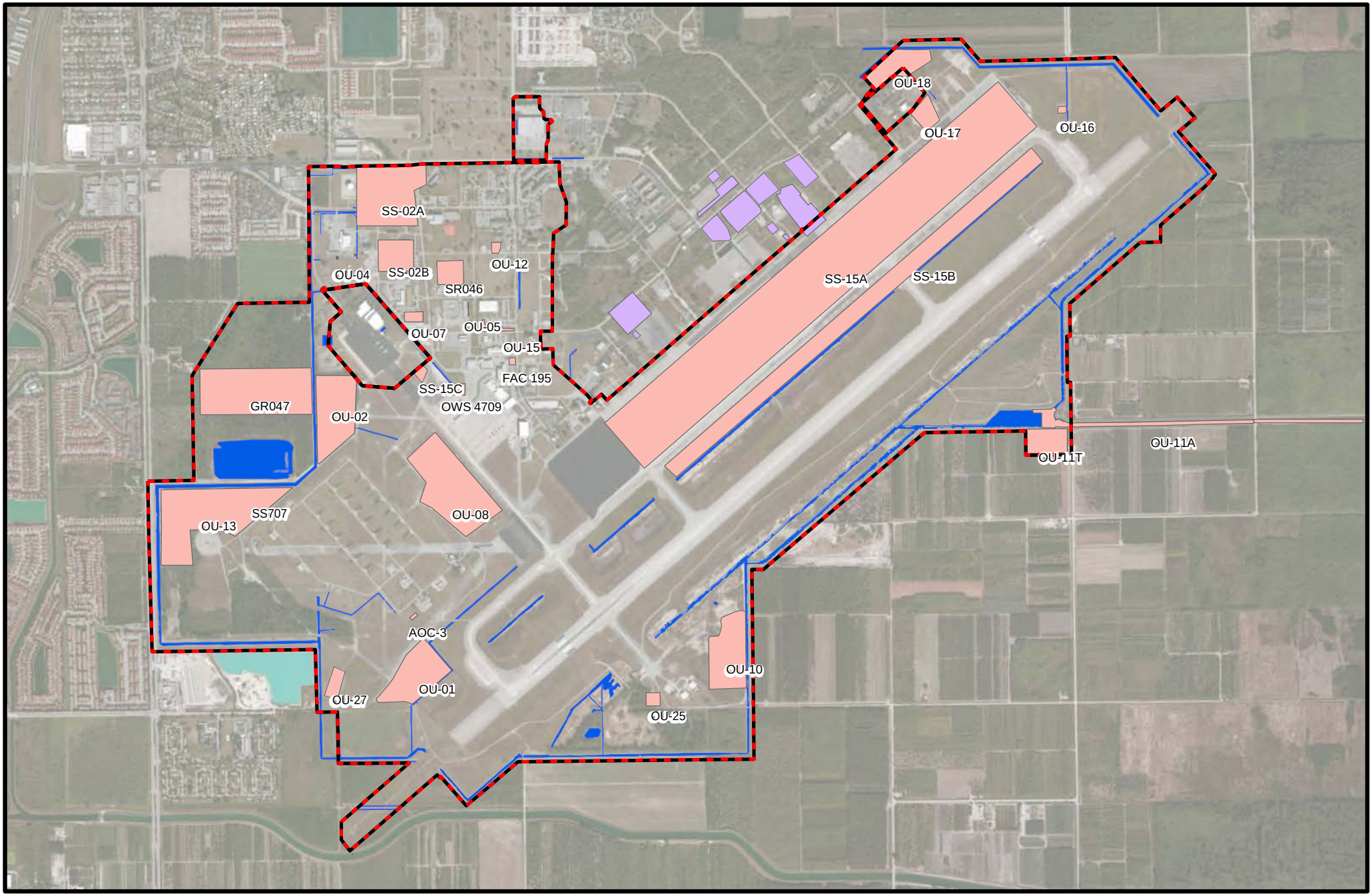


Figure 6-1
IRP Sites
Integrated Natural Resources Management Plan
Homestead Air Reserve Base, Florida

Chapter 7 Natural Resources Program Management

Ecosystems in south Florida have been degraded as a result of human activity over the last century. Much of the area's wetlands have been filled in and an extensive system of canals and channels has been created to support agriculture, urban development, and population growth. Invasive exotic plant and animal species have become widely established in naturalized populations. South Florida restoration efforts include cleaning and restoring water flows, increasing natural habitat, and reestablishing native flora and fauna. These restoration efforts also include restoring coastal ecosystems, protecting threatened habitat and species, and promoting less-polluting agriculture practices, among others.

Natural resource management practices on HARB are designed to meet regulatory requirements and foster sound stewardship of natural resources within the constraints of military mission requirements and BASH and other safety concerns. The primary environmental management issues on HARB include:

- Protecting and maintaining wetland functions
- Restoring pine rockland habitat without using fire
- Controlling/eradicating invasive/exotic species
- Managing water quality
- Maintaining and enhancing natural habitat values and ecosystem functions

These environmental issues are similar to natural resources management requirements occurring throughout south Florida. Implementing measures to move toward or achieve the recommended goals and objectives in this INRMP would support the HARB military mission as well as broader ecosystem needs in the region. Specific issues were identified through communication with public and agency stakeholders, and addressing those forms is the basis of the natural resources management focus in this INRMP consistent with the military mission and applicable law.

7.1 Natural Resources Program Management

USAF oversight for the HARB program is provided by the CEV in conjunction with USAF headquarters and the AFCEC Installation Support Team (IST). The HARB IST is stationed at Patrick AFB, FL.

Federal and Florida stakeholders that contributed to the development of the INRMP include:

- USFWS
- FFWCC
- NPS

7.2 Fish and Wildlife Management

As previously described in Chapter 5, for planning and natural resources management purposes HARB has been divided into 14 land management units. Because of the differing land uses, natural resources, and activities occurring in each, the natural resources management differs among them. The general management objectives for each of these units are summarized below.

Remnant Pine Rockland

The general management objectives for the Remnant Pine Rockland area include evaluating site-specific restoration options to enhance habitat quality and increase wildlife diversity of the pine rockland community. These could include aggressive efforts to remove exotic and hardwood species followed by ongoing maintenance and transplantation of state-listed plant species from

locations in precarious habitat conditions on other parts of the base and through the assistance of Fairchild Tropical Gardens "Connect to Protect" Program. The Remnant Pine Rockland area would also be used as an educational area for local schools.

Phantom Lake and Old Grenade Range

The general management objectives for the Phantom Lake and Old Grenade Range area include exploring the potential for habitat improvements, increase native fish species populations, and remove exotic species.

Southeast Triangle

The primary general management objective for the Southeast Triangle area includes reducing the attraction of infield areas to wading birds and other animals (i.e., lessening the frequency of runway crossings), and reducing potential fire hazards. A second objective is management of exotic species in a manner compatible with transitional zone clearance requirements and the IRP restoration objectives.

Munitions Storage Area

The general management objectives for the Munitions Storage Area will continue to include regular mowing in accordance with safety requirements and to manage for the large populations of Small’s milkpea and sand flax occurring in the area. HARB will continue to provide for the protection of the burrowing owl by providing protective buffers of rough grass around owl burrows. Periodic monitoring for evidence of burrowing owl presence will be conducted. Known or suspected burrows may be flagged and notifications posted. Individuals responsible for groundskeeping at HARB will be trained in the identification of burrowing owls and their burrows, measures for avoidance, and procedures for reporting burrowing owl activity and any incidents of disturbance. Appropriate measures for invasive exotic species control and removal, compatible with BASH reduction and IRP site restoration objectives, will be explored as well.

Northeast Grasslands

The general management objectives for the Northeast Grasslands area will continue to include regular mowing in accordance with safety requirements and to manage for the large populations of Small’s milkpea and sand flax occurring in the area. Additional management practices may include the eventual removal of invasive exotic species in a manner compatible with BASH reduction objectives, airfield transitional zone clearance requirements, and IRP restoration objectives. HARB will periodically monitor the area for evidence of burrowing owl presence. Known or suspected burrows will be flagged and notifications posted. Individuals responsible for groundskeeping at HARB will be oriented in the identification of burrowing owls and their burrows, measures for avoidance, and procedures for reporting burrowing owl activity and any incidents of disturbance.

Grenade Range and Reserves Area

The general management objectives for the Grenade Range and Reserves Area will focus on maintaining the area in accordance with current requirements for mission and safety considerations, such as mowing and cutting back vegetation for maintaining reserves training areas and the airfield transitional zone.

Appropriate measures for invasive exotic species control and removal in this area, compatible with BASH reduction objectives and transitional zone clearance requirements, will be explored as well.

Southwest Clear Zone

The general management objectives for the Southwest Clear Zone include continuing the regular management practices of mowing, maintaining, and monitoring vegetation in the clear zone. Because the area is within the runway clear zone, it will not be managed for habitat enhancement, but will be included as part of efforts toward managing exotic and invasive species. The management approach for exotic species will be compatible with BASH reduction objectives and clear zone requirements.

Hush House Area

The general management objectives for the Hush House Area will focus on maintaining the area in accordance with current requirements for mission and safety considerations, such as mowing and cutting back of vegetation for maintaining the airfield transitional zone. Appropriate measures for controls and removal of invasive exotic species, compatible with BASH reduction objectives and transitional zone clearance requirements, will be identified as well.

Operable Unit 2 Area

The general management objectives for the OU-2 area include identifying appropriate measures and intensity of controls for invasive exotic species removal in this area. An important aspect of invasive and exotic species removal for this area is fuel load reduction. Future management practices for exotic species will be conducted in a manner compatible with BASH reduction objectives and with IRP restoration objectives.

Twin Lakes and Wetland Fringe

The general management objective for the Twin Lakes and Wetland Fringe area consists of enhancing natural communities through the control of exotic invasive species.

Wetland Marsh

The general management objectives for the Wetland Marsh Area include investigating controls for invasive and exotic species removal in a manner compatible with BASH reduction objectives, the use of the site for airfield drainage, and primary and transitional zone clearance requirements.

Boundary Canal

The general management objectives for Boundary Canal focus on maintaining the water quality and flow of the canal and possibly eliminating or minimizing the presence of nuisance plant and animals species.

Administrative and Industrial Support Area

The general management objectives for the Administrative and Industrial Support area are to continue regular mowing and maintenance in accordance with safety requirements and the Grounds Maintenance SOW (Appendix F). HARB will continue to provide for the protection of the burrowing owl by providing protective buffers of rough grass around owl burrows. Periodic monitoring for evidence of burrowing owl presence will be conducted. Known or suspected burrows may be flagged and notifications posted. Individuals responsible for groundskeeping at HARB will be oriented in the identification of burrowing owls and their burrows, measures for

avoidance, and procedures for reporting burrowing owl activity or any incidents of disturbance. In addition, appropriate measures for invasive exotic species control and removal and landscaping with additional native plants, compatible with BASH reduction and IRP and petroleum site restoration objectives, will be identified.

Airfield Area

The general management objectives for the Airfield Area will continue to include regular mowing, maintaining, and monitoring vegetation to maintain compliance with airfield safety requirements. HARB will not manage the area for habitat improvements, but will periodically monitor the area for evidence of burrowing owl presence. Known or suspected burrows will be flagged and notifications posted. Individuals responsible for groundskeeping at HARB will be oriented in the identification of burrowing owls and their burrows, measures for avoidance, and procedures for reporting burrowing owl activity or any incidents of disturbance. Additional management practices for the Airfield Area may include the removal of invasive exotic species. Appropriate measures and intensity of controls for invasive exotic species removal in this area will be compatible with BASH reduction objectives, airfield transitional zone clearance requirements, and restoration objectives for IRP sites.

7.3 Outdoor Recreation and Public Access to Natural Resources

Natural resources-based outdoor recreational opportunities on HARB are limited because of the large portion of acreage that is developed and/or restricted due to safety and security requirements, including explosive safety arcs, the restricted airfield, and other restricted land for training. Hunting and fishing are not permitted on the base. There are no permitted recreational areas for off-road vehicle use. Access to the base is limited to active-duty and reserve military personnel assigned to work at the base, their dependents and accompanied guests; federal civilian employees, their dependents, and accompanied guests; and military retirees.

There are abundant recreational areas available in south Miami-Dade County, including two national parks, one national preserve, an accessible coastline, beaches, and waters along the Atlantic coast, as well as recreation opportunities in the Florida Keys in neighboring Monroe County.

Everglades National Park is approximately 10 miles west of HARB (see Figure 3-1). The park has been designated a World Heritage Site, a Biosphere Reserve, and a Wetland of International Significance. It also received wilderness designation in 1978. The park contains 156 miles of trails (including canoe trails), with 5 miles of surfaced trails. Elevated boardwalk trails include the Anhinga Trail, Pa-hay-okee Overlook, Mahogany Hammock, Eco Pond, West Lake, and Shark Valley. The Hell's Bay Canoe Trail (8 miles) and the Wilderness Waterway (99 miles) are designated national trails. There are three campgrounds within the park: Long Pine Key, Flamingo, and Chekika. There are also 48 designated backcountry campsites (accessible by boat), 5 visitor centers, a research facility, and 2 environmental education camps. Boating, bird watching, and fishing are popular activities in the park.

Biscayne Bay is a shallow, subtropical estuary encompassing approximately 428 mi^2 with a drainage area of 938 mi^2. BNP encompasses about two-thirds (more than 270 mi^2) of Biscayne Bay and 95 percent of the park is water. BNP is approximately 2 miles east of HARB (see Figure 3-1). BNP was established as Biscayne National Monument in 1968, then re-designated in 1980 as BNP to protect both historical and natural features, such as the natural environment of Biscayne Bay, the subtropical marine ecosystem, populations of fish and wildlife, and

submerged cultural resources. BNP protects a rare combination of terrestrial and undersea life and provides a significant number of recreational opportunities. Park activities include boating, canoeing, diving, fishing, kayaking, nature viewing, sailing, swimming, snorkeling, and water skiing.

Big Cypress National Preserve is approximately 30 miles northwest of HARB. The preserve protects over 729,000 acres of swamp land that contains a mixture of tropical and temperate plant communities, which provide habitat for a diverse mix of wildlife. Big Cypress National Preserve was created in 1974 to protect the water quality, natural resources, and ecological integrity of the Big Cypress Swamp. The preserve provides the largest contiguous tract of Florida panther habitat near HARB and is also home to other protected and rare plant and animal species.

7.4 Conservation Law Enforcement

As noted in Section 7.3, there are no public recreation opportunities on HARB and opportunities for DoD personnel are limited.

7.5 Management of Threatened and Endangered Species and Habitats

Management for protected species is included in the general management practices described in Section 7.2. Specific objectives and projects for maintaining T&E species habitats while supporting the military mission are also outlined in Chapter 8, Goal 2.

The PPMP (Appendix E) outlines specific strategies and measures for managing and monitoring existing populations of the federally protected Small's milkpea and sand flax known to occur at HARB. The PPMP identifies strategies to restore areas of HARB to pine rockland habitat, which is the preferred habitat of the Small's milkpea, sand flax, and several other federal and state protected plant species. The conservation measures outlined in the PPMP will be incorporated in an effort to maintain the existing Small's milkpea and sand flax populations on HARB.

Protected plant surveys will be conducted prior to implementing any new actions at HARB that could affect protected species. Following the plant survey, HARB will consult with USFWS to identify and incorporate conservation measures as appropriate to the unique constraints at HARB. Specific conservation measures are outlined in the PPMP and included in Appendix E.

Turf grass and exotic species will not be added to areas that contain Small's milkpea or other listed species. Exotic control measures identified in the PPMP (Appendix E) will be implemented as available funding allows.

Following the proposed bat survey (see Chapter 8, Objective 2.1), HARB will consult with USFWS and add appropriate conservation measures to the INRMP. In the interim, HARB will implement the Florida Bonneted Bat Management Plan (Appendix G) as funding and Air Force regulations allows. HARB will examine any trees or structures before any modification or removal is accomplished to ensure no bats are present.

HARB will continue to monitor the federal register and coordinate with USFWS regarding new species listings in the area.

7.6 Water Resource Protection

All potential stormwater contamination sources at HARB are managed under the SWPPP (HARB, 2012). Through the SWPPP, HARB maintains an updated list of potential contaminants

to water resources, monitors and mitigates spills and leaks, monitors stormwater discharge, and implements appropriate BMPs.

7.7 Wetland Protection

The federal Clean Water Act (CWA) provides a regulatory framework that allows development or other activities affecting wetlands while preserving wildlife habitat and water quality. Section 404 of the CWA created a permitting program for regulating projects that have the potential to impact wetlands. The USACE has authority under Section 404 to issue permits for the discharge of dredged or fill material into jurisdictional wetlands or other waters of the United States. The USEPA, under Section 401 of the CWA, also requires water quality certification for these projects. Prior to implementation of any action that affects a wetland or occurs within a floodplain, a Finding of No Practicable Alternative (FONPA) must be prepared and signed as directed by AFI 32-7064.

According to the *Homestead Air Reserve Base: FINAL Jurisdictional Wetland Report* (AECOM, 2012), there are 14 wetlands within HARB. The majority of these are dominated by herbaceous vegetation. The herbaceous wetlands, which tend to be seasonally flooded, are defined as wet prairie or freshwater marsh. The report includes a description of each wetland. The report identified two forested wetland systems in the southern portion of HARB. However, these forested wetlands were cut and removed and filled to comply with security force protection measures.

Current programs and plans for wetland management include limited treatment of nuisance and exotic species and frequent mowing. Cattails, which tend to dominate other species, have been previously treated on HARB to control their growth and spread. Frequent mowing aids in the maintenance of wet prairies. Deep ruts have developed in wetlands, transitional zones, and surrounding upland areas that may alter hydrology and result in vegetation changes. If rutting continues, upland areas may be converted to wetlands (AECOM, 2012).

Flat topography and the shallow water table affect the hydrology of HARB wetlands. The stormwater reservoir, internal canal and ditch systems, and the Boundary Canal help to control water levels and water flow in wetlands. Overland flow is a major source of water for wetlands. The prevalence of impervious surfaces as a result of the airfield promotes large amounts of stormwater runoff that flows into wetlands near the airfield. Evidence of sustained flooding was noted in several wetlands (AECOM, 2012).

The *Wetlands Removal /Modification Feasibility Study* outlines the mitigation options that are available for future/proposed projects that would impact wetlands. The options include: restoration and/or enhancement of wetlands on HARB, offsite wetland restoration, the purchase of wetland mitigation credits from a mitigation bank, exotic species removal, and upland pine rockland restoration (AECOM, 2009).

7.8 Grounds Maintenance

Grounds maintenance activities at HARB are conducted in accordance with the *Statement of Work (SOW) for Grounds Maintenance of the Cantonment and Munitions Area at Homestead Air Reserve Station Florida* (Appendix F). See Figure 5-3 for the grounds maintenance mowing plan. The SOW requires the contractor to obtain and maintain all licenses/certifications required by the State of Florida and federal agencies for supervision and applications of herbicides/ pesticides in accordance with 40 CFR 171.9 and Florida Statues Chapter 482 “Pest Control.” Types of services required by the SOW include:

- Mowing and trimming grass and removal of grass clippings for improved grounds
- Edging
- Maintaining and pruning shrubs, hedges, and perennial flowers
- Maintaining shrub beds
- Maintaining drainage ditches
- Mowing and trimming along perimeter fenceline

AFI 32-7042 "Solid and Hazardous Waste Compliance" describes the requirements for all aspects of integrated solid waste management, including the content of the Integrated Solid Waste Management Plan (ISWMP); recycling; disposal; handling, storage, and collection; oversight; recordkeeping and reporting; and budgeting. The ISWMP (updated June 2008) includes guidance for managing compostable materials at HARB.

A landscape management plan is proposed for HARB (see Chapter 8, Objective 1.3) to reduce grounds maintenance costs, conserve water, minimize the use of invasive and exotic species, and introduce plants native to the south Florida region.

The proposed landscape management plan will include specific parameters to maintain Small's milkpea populations on HARB, which includes maintaining a mow height between 11 and 14 inches and suspending mowing activities between February and June, as long as HARB's flying missions are not affected. In accordance with the Florida Bonneted Bat Management Plan (Appendix G), landscape management will also be modified to promote foraging and roosting habitat for Florida bonneted bat.

7.9 Forest Management

There are no significant forest stands on HARB and no commercial harvesting occurs. Trees are managed as part of the overall natural resources on the base. Therefore, forest management is not included as a specific part of this INRMP.

7.10 Wildland Fire Management

Homestead AFB is susceptible to wildland fire events within and near the base that could stop or delay the mission-related activities due to heavy smoke over the runway. There have been several small wildfires within the HARB cantonment area and within former Homestead AFB property since 2001, but none developed into major fires requiring serious efforts to control. Substantial fuel loads occur in a number of areas on, adjacent to, or near HARB and the base has been fortunate that no significant wildfires have occurred recently.

In the mid-1990s during the BRAC transition period, a major lightning-ignited wildfire occurred during the dry season within a poorly accessible, heavily overgrown, non-developed area within the western portion of the HARB cantonment area that destroyed a large number of non-native trees and shrubs. Past wildfires in the region have included fires in weeds, grass, brush, and forested areas. In 2004 HARB attempted an experimental prescribed fire action within a dense monoculture of tall non-Australian pines just south of the runway. The prescribed burn was performed by qualified crews (i.e., for logging and burning) from the USDA. The primary purposes of this effort were to resolve a significant BASH issue by removing a major attractant roost site for large wading birds and raptors close to the runway and to conform with airfield height obstruction criteria.

Wildfires within the former Homestead AFB have been very infrequent and relatively small due to quick responses and measured suppression. Regionally there has been a history of wildfires occurring within south Florida on a yearly basis in abandoned farmlands to the south and west of HARB. A number of wildfires were reported near HARB and BNP in 2012 and early 2013.

Recently homes have been built in areas to the west and have reduced the fire potential in this area. The human population will continue to increase in the wildland/urban interface, which is particularly important because a major percentage of wildland fires in south Florida have been demonstrated to be human-caused, by either accidental or deliberate means.

Wildland fires are unlike other fires from the standpoint of fire-fighting. Local topography, fuel load and type, water availability, and weather conditions present different challenges for each wildland fire. Once a wildland fire starts, burning is generally rapid and continuous, and often very intense. The three most important factors that influence wildland fire behavior are fuel type and concentration, weather, and ground surface features and topography. Subsurface fuels can consist of roots, peat, and other partially decomposed matter. Surface fuels can consist of needles, duff, twigs, and brush up to 6 to 10 feet in height. Weather hazards, such as strong wind, can increase fire intensity and supply fresh air to speed combustion to the point that very large fires can create their own winds. In addition, the presence of man-made surface drainage features, especially narrow deep ditches, limits accessibility.

Wildfire management on HARB is conducted to reduce wildfire potential, protect property, protect and enhance valuable natural resources, and promote ecosystem management goals (HARB, 2009b).

The goals and objectives of the HARB wildland fire management program include:

1. The highest goal and first priority of the HARB wildland fire management program is to safely and effectively protect human life and health. The primary objective is to conduct wildland fire operations without human injury or death.
2. The second goal is to protect property (both on- and off-base), with the objective of safely protecting all property and as many natural resources as practicable from wildland fire.
3. The third goal is to effectively use fire as a tool to manage fuel loads and habitat when resources and environmental conditions permit.

The Chief of Fire and Emergency Services (Fire Chief) is the Wildland Fire Program Manager (WFPM) for HARB. The WFPM is authorized by the Installation Commander to certify wildland firefighter professional qualifications, and take all other actions in accordance with AFI 32-7064 and the INRMP. The WFPM may delegate this authority to one or more designees. The Wildland Fire Management organizational structure fits within the installation command structure with other Fire and Emergency Services, and is consistent with National Wildfire Coordinating Group (NWCG) Incident Command System standards.

HARB has developed or is developing regional partnerships for wildland fire management support by means of reciprocal agreements with other governmental agencies and local entities to share human, logistical, and operational resources. Emergency assistance and mutual aid agreements will conform to the guidelines stated in DODI 6055.6 – DoD Fire and Emergency Services Certification Program, and AFI 32-2001, Fire Emergency Services Program.

A Wildfire Management Plan (WFMP) is proposed for HARB (see Chapter 8, Objective 1.6) that will be developed in accordance with AFI 32-7064. The purpose of the WFMP is to reduce wildfire potential, protect property, protect and enhance valuable natural resources, and implement ecosystem management goals and objectives on HARB. The WFMP will directly support the military mission and will be consistent with installation emergency operations plans.

7.11 Agricultural Outleasing

HARB does not sponsor or offer any opportunities for agricultural outleasing such as opportunities for livestock grazing and/or growing of crops on the property.

7.12 Integrated Pest Management Program

HARB has an integrated pest management plan (IPMP) in accordance with AFI 32-1053, "Pest Management Program," which implements DoD 4150.7, "Pest Management Program." The HARB IPMP (most recent update, November 2013) describes pest management requirements, outlines the resources necessary for surveillance and control, and describes the administrative, safety, and environmental requirements of the program. Pests addressed in the plan include weeds and aquatic vegetation, mosquitoes, wasps, crawling insects, nesting birds, and other vertebrate pests such as mice and rats. HARB uses commercial pest control contractors to control insects, rodents, and unwanted vegetation. The USDA Animal and Plant Health Inspection Service (USDA-APHIS) also helps control larger wildlife at HARB. The Miami-Dade Public Works Department is contracted to control mosquitoes. Actions addressing birds on or near the runway are discussed in the base's BASH program, which is contracted to the USDA-APHIS (Appendix C).

Preparation and implementation of an invasive species management plan and development and implementation of an invasive species training course for HARB personnel are projects in this INRMP (see Chapter 8, Objectives 1.4 and 3.2). The invasive species management plan will address initiatives to limit the spread of exotic species and to control or remove invasive species already present on-base. The training courses will provide information to the appropriate HARB personnel on actions that can be taken to reduce the spread of these species.

HARB has worked with NPS on exotic plant and animal control projects, specifically eradication of golden beard grass and the Nile monitor lizard populations occurring on the installation. The ECISMA, as described in Section 5.5, aims to manage exotic species and restore the Everglades National Park. These efforts will improve habitat quality in the area, which will indirectly benefit the natural resources on HARB.

HARB recently applied for and received a special purpose permit through FFWCC to capture, hold, and relocate nuisance American alligators. The permit was effective July 2014 and expires in July 2019.

7.13 Bird/Wildlife Aircraft Strike Hazard (BASH)

Chapter 7 of AFI 91-202, "The U.S. Air Force Mishap Prevention Program" and Air Force Pamphlet 91-212, "BASH Management Techniques," establish procedures and guidelines for the development of the HQ 482nd FW BASH Reduction Program Plan (Appendix C). The purpose of the 482nd FW BASH Plan, which is contracted to the USDA-APHIS, is to minimize aircraft exposure to potentially hazardous bird strikes or strikes with other wildlife. The plan is designed to:

- Establish procedures to identify high-hazard situations and to aid supervisors and pilots in altering/discontinuing flying operations when required
- Establish aircraft and airfield operating procedures to avoid high-hazard conditions
- Provide for disseminating information to all assigned and transient pilots on bird hazards and procedures for bird avoidance

- Establish guidelines to decrease airfield attractiveness to birds
- Provide guidelines for dispersing birds when they occur on the airfield
- Establish a Bird Hazard Working Group and designate responsibilities to its members

The plan addresses hazards from resident and migratory bird species. Two distinctive land features contribute to the majority of BASH-related issues at HARB:

- HARB is between two national parks (Everglades National Park and BNP; see Figure 3-1) that serve as breeding and migratory grounds for numerous bird species
- The approach/departure end of the main runway is approximately 5 miles south of the South Dade Landfill, which is owned and operated by Miami-Dade County. This landfill and the marshes near it attract vultures, gulls, ducks, and wading birds.

7.14 Coastal Zone and Marine Resources Management

Under provisions of the federal CZMA of 1972, any federal activity that has the potential to impact a state's coastal resources is reviewed for consistency with the state's approved Coastal Zone Management Program. CZMA Section 304 excludes federal lands from the coastal zone; however, Section 305 requires federal agencies conducting activities that directly affect a state's coastal zone to make sure any such activities are consistent, to the maximum extent practicable, with the state's program. The Florida Coastal Management Program (FCMP) comprises 23 Florida statutes. Projects that may affect any land or water use, or natural resource of the coastal zone, are subject to the FCMP and the consistency review process. A manual entitled "Florida Coastal Program Guide: A Guide to the Federally Approved Florida Coastal Management Program" is available at www.dep.state.fl.us.

The HARB INRMP, because it would enhance natural resources in Florida's coastal zone, is consistent with the FCMP. The INRMP will be reviewed by the Florida Clearinghouse as part of the state and Federal review, and its consistency with the CZMA will be confirmed at that time. A Memorandum of Understanding was established between the DoD and the State of Florida to set up the Florida Clearinghouse. The Florida Clearinghouse allows documents to be reviewed by federal, state, and local agencies within a 60-day period.

7.15 Cultural Resources Protection

The NPS conducted a survey of Homestead AFB in 1986 to determine the need for and scope of any additional investigations to discover significant cultural resources (Air Combat Command [ACC], 1992). The report concluded that there was virtually no probability for the discovery of significant archaeological resources on Homestead AFB. The Florida State Historic Preservation Officer (SHPO) concurred with that conclusion.

Two historic architectural inventories were conducted on the former Homestead AFB. The first concentrated on structures constructed prior to 1945; six were identified (ACC, 1992). All but one of these pre-1945 architectural resources were destroyed during Hurricane Andrew. The surviving structure, Building 121, is a 1942 maintenance shop that has been determined not eligible for the National Register of Historic Places (USAF and FAA, 2000).

Due to the findings of the earlier investigations, HARB submitted a petition for waiver from the requirement to prepare an Integrated Cultural Resources Management Plan (ICRMP). The waiver was approved by the AFRC-HQ Civil Engineer in April 2008. However, in accordance with AFI 32-7065, "Cultural Resources Management," HARB has a contingency cultural

resources management plan to addresses actions required in the event subsurface archaeological resources should be found during land disturbance activities.

The second architectural survey was recently conducted in 2012 (URS, 2012). The survey evaluated 32 buildings, primarily within the munitions and hush house area of HARB. All 32 buildings were determined not eligible for the National Register of Historic Places. However, the K-9 cemetery located near the Munitions Storage Area was determined potentially eligible for the National Register of Historic Places.

7.16 Public Outreach

HARB is proposing to restore the Remnant Pine Rockland area within the installation boundaries and use it as a "living laboratory" for the nearby Air Base Elementary School on SW 288th Street. The "living laboratory" would be used as a teaching tool to educate local school children about the now severely threatened native pine rockland ecosystem and the multiple protected species that are endemic to the habitat.

7.17 Geographic Information System (GIS)

HARB GIS services are capable of processing GIS requirements associated with natural resource management and project implementation. Natural resources staff at HARB have full access to these data. Survey data regarding natural resources are maintained and regularly updated in a GIS database for use by HARB during planning and decision-making to ensure consistency between the military mission and natural resources protection.

Chapter 8 Management Goals and Objectives

This section presents the planned actions and the mechanisms for their implementation that will result in attainment of desired conditions for natural resources management on HARB. These actions and mechanisms are essential to support the military mission and to implement effective natural resources management.

8.1 INRMP Program Goals and Objectives

The three goals developed for this HARB INRMP are the focal points for implementation of natural resources management over the next 5 years. The goals reflect the desired results of natural resources management efforts at HARB. These goals were developed with consideration given to existing EOs, AFIs, natural resources issues and challenges at the installation, identified stewardship opportunities, and the need for resource management to be compatible with the continued military mission of HARB. The goals are:

Goal 1: Conserve and enhance the land and water resources of HARB through a program of conservation management that is compatible with the military mission.

Goal 2: Improve and maintain the quality of native vegetation communities and T&E species habitats while supporting the military mission.

Goal 3: Promote stewardship of HARB Natural Resources through community education and conservation volunteer opportunities.

Each goal is supported by one or more objectives. Objectives provide more specific management actions that, when combined with accomplishing other objectives, will serve to achieve the stated goal or advance conditions toward the stated goal. One or more projects have been identified to accomplish each objective.

Some of the INRMP objectives and planned projects are applicable to specific management areas on HARB (Table 8-1). These are listed along with their applicability to each of the 14 areas. Those specified for all 14 areas are either programmatic in nature, applicable base-wide, or related to overall interaction with the HARB natural resources programs and external stakeholders.

Completion of projects fulfills the objectives for accomplishing natural resources management objectives. When the objectives are accomplished, the INRMP goal has been achieved. Projects tend to be discrete stand-alone efforts with additional budget expenditure requirements, and thus are presented as line items in the proposed budget for INRMP implementation. In accordance with AFI 32-7064 (September 17, 2004), projects must be completed within the period covered by the plan, subject to available funding. Appendix A provides a more detailed description for each project.

8.2 Goals with Supporting Objectives and Projects

Goal 1: Conserve and enhance the land and water resources of HARB through a program of conservation management that is compatible with the military mission.

Present and future development of facilities to serve the military mission requires a commitment to the management of land and water resources of HARB. Applied conservation measures and BMPs are important aspects of good stewardship and are necessary to effectively support ecosystems. Important land and water resource management issues at HARB include: (1) wetlands and drainage management; (2) water quality and conservation; (3) vegetation control and management; and (4) management of protected species and native habitats.

To conserve and enhance the land and water resources of HARB while supporting the military mission, various programs need to be implemented to achieve the following objectives:

Objective 1.1: Continue existing and establish new programs and procedures to monitor and maintain water resources and water quality. Implement appropriate practices and procedures for reducing demand for water through water-conservation measures.

Objective 1.2: Implement environmentally beneficial landscaping and grounds maintenance practices.

Objective 1.3: Evaluate land management practices to promote the safety of the military mission.

Objective 1.1: Continue existing and establish new programs and procedures to maintain water resources and water quality. Implement appropriate practices and procedures for reducing demand for water through water-conservation measures

EO 11990, Protection of Wetlands, 24 May 1997, directs all federal agencies, including the military, to avoid the destruction, loss, or degradation of wetlands whenever there is a practical alternative. The wetlands of HARB play an important role in stormwater runoff infiltration, groundwater recharge, and water quality improvement. The following management strategies have been developed to protect water quality and maintain wetland functions and values and to comply with EO 11990.

EO 13514, Federal Leadership in Environmental, Energy, and Economic Performance, October 5, 2009, requires all federal agencies to meet a goal of 26 percent improvement of water efficiency by 2020. Efforts for accomplishing this objective will be in accordance with EO 13514

Projects:

1.1.1: Maintain a wetland inventory and monitoring program to assess wetland functions and values over time.

1.1.2: Update the jurisdictional wetland delineation for any project where wetlands are proposed to be affected.

1.1.3: Periodically remove accumulated debris and sediments from outfall culverts to enhance circulation and settling properties.

1.1.4: Monitor water quality in wetland areas to determine their ability to perform wetland functions (i.e., runoff filtration and retention, groundwater recharge, and other water quality/water supply benefits).

1.1.5: Using the results of wetland assessments and field surveys, develop a wetland mitigation policy and procedures to address planned or proposed development actions and the regulatory requirement to offset impacts.

1.1.6: Periodically update the wetland mitigation policy and procedures based on new information and guidelines adopted by DoD, USAF, and regulatory agencies.

1.1.7: Continue to implement and review annually (update as needed) the SWPPP for HARB.

1.1.8: Continue groundwater monitoring activities at IRP sites, as scheduled.

1.1.9: Continue to evaluate potential water-conservation measures for HARB

Objective 1.2: Implement environmentally sound landscaping and grounds maintenance practices.

EO 13423, Strengthening Federal Environmental, Energy, and Transportation Management, 27 January 2007, promotes sustainability in management of federal facility lands through implementation of environmentally sound landscaping practices and programs while reducing water consumption. AFI 32-7064, Chapter 11 directs installations to make maximum use of regionally native plants, minimize watering needs, avoid invasive and exotic species, reduce chemical use, minimize effects on natural habitats, and reduce maintenance. By using native species and xeriscaping concepts, HARB will support EO 13423 and AFI 32-7064.

Projects: **1.2.1**: Prepare and implement a Landscape Management Plan

1.2.2: Prepare and implement a Wildfire Management Plan

Objective 1.3: Evaluate land management practices to promote the safety of the military mission.

Identify and evaluate areas where woody vegetation encroaches into airfield clear zones, primary surface area, and transitional surfaces in accordance with *Chapter 3, Unified Facilities Criteria 3-260-01, Airfield and Helicopter Planning and Design*, and implement actions for the removal of this vegetation.

Project:

1.3.1: Maintain base woody vegetation to prevent height obstructions within airfield clear zones, primary surface area, and transitional surfaces.

1.3.2: Maintain herbaceous vegetation near airfields to remove attractants for birds and prevent problems from occurring.

Goal 2: Improve and maintain the quality of native vegetation communities and threatened and endangered (T&E) species habitats while supporting the military mission.

Near and within the boundaries of HARB, few of the native natural communities (including T&E plant and animal species) occur today. In addition, nuisance wildlife species have increased in population and/or have concentrated in areas where they are now a serious threat to T&E species populations, human health, and/or the military mission. Regional ecosystem management initiatives for south Miami-Dade County are designed to protect, maintain, and restore the natural communities for plant and animal life. Efforts for achieving this goal will contribute to a more diversified native plant and animal population at HARB and to the overall restoration efforts for south Miami-Dade County.

Objective 2.1: Protect, enhance, and maintain natural communities to support native fish and wildlife species at HARB in a manner that is compatible with the military mission.

Objective 2.2: Conserve and protect the habitats for federally and state-listed T&E species, and SSC.

Objective 2.3: Reduce and control populations of invasive and exotic plant species to minimize conflicts with the military mission and to reduce adverse impacts to native communities.

Objective 2.4: Institute controls for nuisance and exotic wildlife that may adversely affect the health of the ecosystem and/or military mission.

Objective 2.1: Protect, enhance, and maintain natural communities to support native fish and wildlife species at HARB in a manner that is compatible with the military mission.

Projects:

2.1.1: Implement the *Pine Rockland Restoration and Management Plan* (Golder, 2012b).

2.1. 2: Implement management and restoration recommendations and strategies in the *Phantom Lake Improvements and Constraints Study* (Golder, 2013a).

2.1. 3: Implement management and restoration recommendations and strategies in the *Twin Lakes Feasibility Study* (Golder, 2013b).

2.1.4: Incorporate management strategies for Florida bonneted bat into conservation programs for natural communities.

2.1. 5: Develop a Burrowing Owl Management Plan.

2.1.6: Conduct a quantitative fish study.

2.1.7: Conduct a Military Canal Flora and Fauna Baseline Study

2.1.8: Conduct the following reconnaissance surveys to identify animal species present on HARB:

- Endemic Butterfly and Dragonfly Survey
- Migratory Bird Survey
- Qualitative Herpetology Survey
- Qualitative Bat Survey

Objective 2.2: Conserve and protect the habitats for federal and state-listed T&E species and SSC.

Projects:

2.2.1: Implement management strategies for Small's milkpea and sand flax populations as outlined in the *Protected Plant Management Plan* (Appendix E).

2.2.2: Implement the *Protected Plant Management Plan* (Appendix E).

2.2.3: Work with USFWS to identify and implement management strategies for Florida bonneted bat foraging and roosting habitat.

2.2.4: Conduct reconnaissance surveys to update information regarding the presence and distributions of listed T&E species and their habitats.

2.2.5: Maintain maps of natural features that occur within the base (wetlands, surface water bodies, natural communities, etc.).

2.2.6: For any newly identified federally listed plant and animal species on HARB, coordinate with AFCEC and HQ AFRC to evaluate the need for modifications or initiation of habitat conservation plans.

2.2.7: Review information from resources agencies, as available, regarding the status for T&E species in the region. Determine whether special requirements for T&E species surveys are needed and whether changes in survey frequency are warranted.

2.2.8: Routinely review the BASH-potential database maintained at HARB for occurrences of any listed SSC.

2.2.9: Update the *Threatened and Endangered Species Survey and Management Plan* (e^2M, Inc. 2005a).

Objective 2.3: Reduce and control populations of invasive and exotic plant species to minimize conflicts with the military mission and to reduce adverse impacts to native communities.

Efforts for accomplishing this objective will minimize potential for further deterioration of native plant communities and wildlife habitats on HARB; reduce accumulation of fire fuel loads that could cause interruption of airfield operations should wildfire occur; and enhance visibility for security of the base perimeter. These efforts will be consistent with the intent of Section 2 of *EO 13112, Invasive Species* (February 3, 1999), which requires (within budget limitations) the implementation of programs and authorities for the prevention, detection, and monitoring of invasive species as well as restoration of invaded habitats.

Projects:

2.3.1: Prepare an Updated Invasive and Exotic Species Management Plan (IESMP).

2.3.2: Evaluate the feasibility of enhancing the natural functions of the Grenade Range and Reserves areas through the removal of invasive and exotic plant species.

Objective 2.4: Institute controls for nuisance and exotic wildlife populations that may adversely affect the health of the ecosystem and/or the military mission.

Projects:

2.4.1: As a BASH reduction measure, evaluate the reduction or elimination of nuisance wildlife attractants (e.g., fruit bearing trees) to reduce the incidence of exotic parrot flocks and iguanas frequenting the base.

2.4.2: Control fire ant colonies, rodents, and other pests on the grounds of the base through continued implementation of the Integrated Pest Management Program.

2.4.3: Conduct a radio-tracking survey of large mammals (ex: bobcats, coyotes, and foxes) occurring on HARB.

2.4.4: Implement removal and management practices outlined in the *Homestead ARB Caiman Removal Feasibility Study* (AMEC, 2012).

2.4.5: Implement initiatives to minimize and control invasive and exotic plants species as well as the competing exotic caimans within the habitats that are required for alligator populations.

2.4.6: Conduct a radio-tracking survey of Crocodilian species (crocodiles, alligators, and caimans) and their movements throughout HARB.

Goal 3: Promote stewardship of HARB Natural Resources through community education and conservation volunteer opportunities.

Management of a sustainable conservation program requires knowledge, awareness, education, training, and responsible participation of all individuals potentially affecting, or affected by the natural system. Adjustments must be made to management practices in response to increased knowledge and/or changing conditions. In working toward the following objectives, HARB will continue to build upon efforts for achieving a sustainable conservation program.

Objective 3.1: Incorporate the concept of ecosystem management into all planning and management processes. Ensure that ongoing and future land use activities at HARB are compatible to the greatest extent possible with the conservation of natural resources.

Objective 3.2: Implement training programs for effective natural resources conservation, measures to enhance environmental and conservation awareness on the installation, and conservation stewardship initiatives.

Objective 3.3: Coordinate with government agencies and non-government organizations engaged in the implementation of region-wide plans for ecosystems restoration and natural resources management in south Miami-Dade County.

Objective 3.1: Incorporate the concept of ecosystem management into all planning and management processes. Ensure that ongoing and future land use activities at HARB are compatible to the greatest extent possible with the conservation of natural resources.

Projects:

3.1.1: Develop a working team at HARB to integrate the concepts in the INRMP into existing plans and programs at the installation.

3.1.2: Continue the work of the HARB ESOHC.

3.1.3: For new projects, determine the need for compliance with Florida Coastal Zone Management Program.

Objective 3.2: Implement training programs for effective natural resources conservation, measures to enhance environmental and conservation awareness on the installation, and conservation stewardship initiatives.

Projects:

3.2.1: Develop a T&E species training course for HARB personnel and contractors.

3.2.2: Develop an invasive species training course for HARB personnel and contractors.

3.2.3: Use pamphlets, flyers, command units, and the internet to provide information about HARB's natural resources to installation personnel and visiting commands.

3.2.4: Identify projects or use public events (e.g., Earth Day) to offer hands-on training and individual participation in activities to better demonstrate the concept, application, and importance of conservation and ecosystem management.

3.2.5: Establish a "Living Laboratory" pine rockland for in conjunction with the nearby Air Base Elementary School along SW 288th Street.

Objective 3.3: Coordinate with government agencies and non-government organizations engaged in the implementation of region-wide plans, programs, and projects for ecosystems restoration and natural resources management in south Miami-Dade County.

Projects:

3.3.1: Identify programs that may be applicable to HARB, especially in terms of potential partnership initiatives to promote stewardship plans, foster conservation awareness, and provide or receive technical assistance.

3.3.2: Monitor changes to and actions completed for ecosystem management initiatives undertaken by the government and non-government entities.

3.3.3: Evaluate consultation with AFCEE, HQ AFRC, and the Miami-Dade County DERM for development of conservation plans and plant/wildlife studies.

TABLE 8-1
INRMP Objectives, Strategies, and Planned Projects
HARB Integrated Natural Resources Management Plan

	Objectives, Strategies, and Projects	Boundary Canal	Administrative and Industrial Support	Airfield Area	Grenade Range and Reserves area	Hush House Area	Munitions Area	Northeast Grasslands	Operable Unit (OU)-2	Phantom Lake, including Old Grenade Range	Remnant Pine Rockland	Southeast Triangle	Southwest Clear Zone	Twin Lakes and Wetland Fringe	Wetland Marsh
Objective 1.1:	**Continue existing and establish new programs and procedures to maintain water resources and water quality. Implement appropriate practices and procedures for reducing demand for water through water conservation measures**														
Project 1.1.1:	Maintain a wetland inventory and monitoring program.	X		X		X				X		X		X	X
Project 1.1.2:	Update the jurisdictional wetland delineation for any project where wetlands are proposed to be affected.	X		X		X				X		X		X	X
Project 1.1.3:	Periodically remove accumulated debris and sediments from outfall culverts.	X										X			
Project 1.1.4:	Monitor water quality in wetland areas.	X		X		X				X		X		X	X
Project 1.1.5:	Develop a wetland mitigation policy and procedures to address planned or proposed development actions.	X		X		X				X		X		X	X
Project 1.1.6:	Update the wetland mitigation policy and procedures based on new information and guidelines.														
Project 1.1.7:	Continue to implement and review annually (update as needed) the SWPPP.														
Project 1.1.8:	Continue groundwater monitoring activities at IRP sites, as scheduled.		X	X	X	X		X	X	X		X		X	
Project 1.1.9:	Continue to evaluate potential water conservation measures for HARB		X												

TABLE 8-1
INRMP Objectives, Strategies, and Planned Projects
HARB Integrated Natural Resources Management Plan

Objectives, Strategies, and Projects		Boundary Canal	Administrative and Industrial Support	Airfield Area	Grenade Range and Reserves area	Hush House Area	Munitions Area	Northeast Grasslands	Operable Unit (OU)-2	Phantom Lake, including Old Grenade Range	Remnant Pine Rockland	Southeast Triangle	Southwest Clear Zone	Twin Lakes and Wetland Fringe	Wetland Marsh
Objective 1.2:	**Implement environmentally sound landscaping and grounds maintenance practices.**														
Project 1.2.1:	Prepare and implement a Landscape Management Plan		X	X	X						X				
Project 1.2.2:	Prepare and implement a Wildfire Management Plan	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Objective 1.3:	**Evaluate land management practices to promote the safety of the military mission.**														
Project 1.3.1:	Maintain woody vegetation to prevent height obstructions within airfield clear zones, primary surface area, and transitional surfaces.	X	X	X	X	X						X	X	X	X
Project 1.3.2:	Maintain herbaceous vegetation near airfields to remove attractants for birds and prevent problems from occurring	X	X	X	X	X						X	X	X	X
Objective 2.1:	**Protect, enhance, and maintain natural communities to support native fish and wildlife species at HARB in a manner that is compatible with the military mission**														
Project 2.1.1:	Implement the *Pine Rockland Restoration and Management Plan* (Golder, 2012b).										X				
Project 2.1.2:	Implement management and restoration recommendations and strategies in the *Phantom Lake Improvements and Constraints Study* (Golder, 2013a).									X					

TABLE 8-1
INRMP Objectives, Strategies, and Planned Projects
HARB Integrated Natural Resources Management Plan

Objectives, Strategies, and Projects		Boundary Canal	Administrative and Industrial Support	Airfield Area	Grenade Range and Reserves area	Hush House Area	Munitions Area	Northeast Grasslands	Operable Unit (OU)-2	Phantom Lake, including Old Grenade Range	Remnant Pine Rockland	Southeast Triangle	Southwest Clear Zone	Twin Lakes and Wetland Fringe	Wetland Marsh
Project 2.1.3:	Implement management and restoration recommendations and strategies in the *Twin Lakes Feasibility Study* (Golder, 2013b).													X	
Project 2.1.4:	Incorporate management strategies for Florida bonneted bat into conservation programs for natural communities.			X	X	X	X	X	X	X	X	X	X	X	X
Project 2.1.5:	Develop a Burrowing Owl Management Plan			X			X								
Project 2.1.5:	Conduct a quantitative fish study	X		X						X		X		X	X
Project 2.1.6:	Conduct a Military Canal Flora and Fauna Baseline Study											X			
Project 2.1.7:	Conduct an (1) Endemic Butterfly and Dragonfly survey, (2) Migratory Bird Survey, (3) Qualitative Herpetology Survey, and (4) Qualitative Bat Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Objective 2.2:	**Conserve and protect the habitats for federal and state-listed T&E species and SSC.**														
Project 2.2.1:	Implement management strategies for Small's milkpea and sand flax as outlined in the *Protected Plant Management Plan*		X	X	X	X	X	X	X	X	X		X		
Project 2.2.2:	Implement the *Protected Plant Management Plan* (Appendix E)									X	X				
Project 2.2.3:	Work with USFWS to identify and implement management strategies for Florida bonneted bat foraging and roosting habitat.	X	X	X	X	X	X	X	X	X	X	X	X	X	X

TABLE 8-1
INRMP Objectives, Strategies, and Planned Projects
HARB Integrated Natural Resources Management Plan

Objectives, Strategies, and Projects		Boundary Canal	Administrative and Industrial Support	Airfield Area	Grenade Range and Reserves area	Hush House Area	Munitions Area	Northeast Grasslands	Operable Unit (OU)-2	Phantom Lake, including Old Grenade Range	Remnant Pine Rockland	Southeast Triangle	Southwest Clear Zone	Twin Lakes and Wetland Fringe	Wetland Marsh
Project 2.2.4 :	Conduct reconnaissance surveys to update the presence and distributions of listed T&E species and their habitats	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Project 2.2.5:	Maintain maps of natural features that occur within the base (wetlands, surface water bodies, natural communities, etc.).	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Project 2.2.6:	For any newly identified federally listed plant and animal species on HARB, coordinate with AFCEC and HQ AFRC to evaluate the need for modifications or initiation of habitat conservation plans.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Project 2.2.7 :	Review information from resources agencies, as available, regarding the status for T&E species in the region.														
Project 2.2.8:	Routinely review the BASH-potential database maintained at HARB for occurrences of any listed SSC.														
Project 2.2.9:	Update the *Threatened and Endangered Species Survey and Management Plan* (e^2M, Inc. 2005a)														
Objective 2.3	**Reduce and control populations of invasive and exotic plant species to minimize conflicts with the military mission and to reduce adverse impacts to native communities.**														
Project 2.3.1:	Prepare an Updated IESMP	X	X	X	X	X	X	X	X	X	X	X	X	X	X

TABLE 8-1
INRMP Objectives, Strategies, and Planned Projects
HARB Integrated Natural Resources Management Plan

Objectives, Strategies, and Projects		Boundary Canal	Administrative and Industrial Support	Airfield Area	Grenade Range and Reserves area	Hush House Area	Munitions Area	Northeast Grasslands	Operable Unit (OU)-2	Phantom Lake, including Old Grenade Range	Remnant Pine Rockland	Southeast Triangle	Southwest Clear Zone	Twin Lakes and Wetland Fringe	Wetland Marsh
Project 2.3.2:	Evaluate the feasibility of enhancing the natural functions of the Grenade Range and Reserves areas through the removal of invasive and exotic plant species				X										
Objective 2.4:	**Institute controls for nuisance and exotic wildlife populations that may adversely affect the health of the ecosystem and/or the military mission.**														
Project 2.4.1:	As a BASH reduction measure, evaluate the reduction or elimination of nuisance wildlife attractants (e.g., fruit bearing trees).	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Project 2.4.2:	Control fire ant colonies, rodents, and other pests on the grounds of the base.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Project 2.4.3:	Conduct a radio-tracking survey of large mammals (e.g. coyotes, foxes, etc.) populations at HARB. Implement measures to control populations that may conflict the military mission.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Project 2.4.4:	Implement removal and management practices outlined in the *Homestead ARB Caiman Removal Feasibility Study* (AMEC, 2012).	X		X						X		X		X	X
Project 2.4.5:	Implement initiatives to minimize and control invasive and exotic plants species as well as the competing exotic caimans within the habitats that are required for alligator populations.	X		X						X		X		X	X
Project 2.4.6:	Conduct a radio-tracking survey of Crocodilian species at HARB.	X								X		X		X	X

TABLE 8-1
INRMP Objectives, Strategies, and Planned Projects
HARB Integrated Natural Resources Management Plan

	Objectives, Strategies, and Projects	Boundary Canal	Administrative and Industrial Support	Airfield Area	Grenade Range and Reserves area	Hush House Area	Munitions Area	Northeast Grasslands	Operable Unit (OU)-2	Phantom Lake, including Old Grenade Range	Remnant Pine Rockland	Southeast Triangle	Southwest Clear Zone	Twin Lakes and Wetland Fringe	Wetland Marsh
Objective 3.1:	**Incorporate the concept of ecosystem management into all planning and management processes. Ensure that ongoing and future land use activities at HARB are compatible to the greatest extent possible with the conservation of natural resources.**														
Project 3.1.1:	Develop a working team at HARB to integrate the concepts in the INRMP into existing plans and programs at the installation.														
Project 3.1.2:	Continue the work of the HARB ESOHC.														
Project 3.1.3:	For new projects, determine the need for compliance with Florida Coastal Zone Management Program	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Objective 3.2:	**Implement training programs for effective natural resources conservation, measures to enhance environmental and conservation awareness on the installation, and conservation stewardship initiatives.**														
Project 3.2.1:	Develop a T&E species training course for HARB personnel and contractors														
Project 3.2.2:	Develop an invasive species training course for HARB personnel and contractors														
Project 3.2.3:	Provide information about HARB's natural resources using pamphlets, flyers, command units, and the internet														

TABLE 8-1
INRMP Objectives, Strategies, and Planned Projects
HARB Integrated Natural Resources Management Plan

Objectives, Strategies, and Projects		Boundary Canal	Administrative and Industrial Support Airfield Area	Grenade Range and Reserves area	Hush House Area	Munitions Area	Northeast Grasslands	Operable Unit (OU)-2	Phantom Lake, including Old Grenade Range	Remnant Pine Rockland	Southeast Triangle	Southwest Clear Zone	Twin Lakes and Wetland Fringe	Wetland Marsh
Project 3.2.4:	Identify projects or use public events (e.g., Earth Day) to offer hands-on training and individual participation in activities to better demonstrate the concept, application, and importance of conservation and ecosystem management													
Project 3.2.5:	Establish a "Living Laboratory" pine rockland for in conjunction with the nearby Air Base Elementary School along SW 288th Street.								X	X				
Objective 3.3:	**Coordinate with government agencies and non-government organizations engaged in the implementation of region-wide plans, programs, and projects for ecosystems restoration and natural resources management in south Miami-Dade County.**													
Project 3.3.1:	Identify programs to promote stewardship plans, foster conservation awareness, and provide or receive technical assistance.													
Project 3.3.2:	Monitor changes to and actions completed for ecosystem management initiatives undertaken by the government and non-government entities.													
Project 3.3.3:	Evaluate consultation with AFCEE, HQ AFRC, and the Miami-Dade County DERM for development of conservation plans and plant/wildlife studies.													

Chapter 9 INRMP Implementation

AFI 32-7064 provides specific procedures and a time-line for the approval and revisions of an INRMP. The INRMP must be signature-endorsed by the Wing Commander, and agency representatives of the USFWS and the FFWCC also must sign the INRMP to reflect mutual agreement on those portions of the INRMP within the scope of their authority. In cooperation with the USFWS and FFWCC, the INRMP will be updated every 5 years. The INRMP will be reviewed annually by the CEV (see also Section 2.2), with the cooperation of the USFWS and the FFWCC. At its discretion, the CEV may seek assistance from the AFCEC, HQ AFRC, USFWS, FFWCC, and/or other agencies or individuals during the annual review. All annual and 5-year reviews will incorporate, as applicable, the new *Streamlined INRMP Review Procedures* issued in July 2013.

In the event of a significant change in the management approach for HARB's natural resources, resulting from military mission realignment, property boundary changes, etc., an INRMP update may be required prior to the scheduled 5-year interval. The CEV would consult with HQ AFRC and AFCEC to determine the need for, and scope of, any interim INRMP updates; the Wing Commander, the USFWS, and the FFWCC must approve any major interim updates.

9.1 Work Plans

This INRMP reflects the commitment set forth by HARB to conserve, protect, and enhance the natural resources present on the base. An ecosystem approach was used to develop the management actions for each resource area.

Work plans will be developed for the projects listed in Table 9-1. Each work plan will detail the description of the project, the year and timeframe for completing the project, the estimated number of labor hours needed to complete the project, and what deliverables will be produced for the project. The projects proposed for this INRMP may not be accomplished within the established timelines established the work plans due to a number of factors (e.g., budget and labor constraints). However, they remain important to the proper management of HARB's natural resources. Therefore, the projects presented in Table 9-1 will be modified as part of the annual review of this INRMP by the INRMP Working Group to ensure that these tasks are continually emphasized and accomplished when practicable.

Funding for implementation of this INRMP is required by the SAIA. However, not all projects and programs identified in this INRMP will receive immediate funding. For the purpose of deciding funding priorities, projects are classified as Level 0, 1, 2, or 3 (AFI 32-7001).

- **Level 0 – Maintain Compliance (Operations and Services)**. Level 0 requirements include activities such as the recurring administrative, personnel, and other costs associated with managing EQ programs. These programs are necessary to maintain environmental compliance, meet EO goals/objectives, and prevent natural resource degradation that may affect military readiness.
- **Level 1 – Fix Noncompliance**. Level 1 requirement corrects a non-conformance or out-of-compliance condition with a supported driver in the programmed year and must receive funding. A supported driver includes federal, state, and local laws and regulations; legal or regulatory mandates (e.g., consent orders, judicial decrees, etc.); tribal laws; EOs; and DoD or AF regulations. For installations outside the US or its territories, supported drivers include the OEBGD, FGS, obligations under binding international agreements (e.g., the German

Supplementary Agreement to the North Atlantic Treaty Organization (NATO) Status of Forces Agreement (SOFA)), and other applicable DoD policy and AF directives that specifically apply to overseas locations. Level 1 projects also include those that currently conform or comply with applicable requirements but are necessary to prevent non-conformance and non-compliance in the programmed year, as well as P2 projects with a 10-year or less return on investment and/or an elimination or significant reduction of a significant aspect (to include reduction of compliance burdens).

- **Level 2 – Prevent Noncompliance**. Level 2 requirements are for activities and projects that are currently in compliance, but are necessary to prevent non-compliance with an applicable driver or mission deadline beyond the programmed year. These requirements are generally the same as Level 1 requirements except for the timing of the non-compliance.
- **Level 3 – Enhance Environment**. Level 3 requirements are for activities and projects and non-recurring requirements not explicitly required by an applicable driver, but are needed to enhance the environment beyond otherwise compliant conditions or to achieve overall environmental goals and objectives.

9.2 Natural Resources Management Staffing

HARB is responsible for implementing all activities for the management of its natural resources and the HARB Wing Commander is the responsible landowner. As the responsible party for HARB's natural resources, the Wing Commander has delegated implementation authority for natural resources management activities to the CEV. Other base personnel, such as Security; Base Civil Engineer (BCE), Services (Morale, Welfare, and Recreation [MWR]); and the Air Operations Officer have functions that involve the management and/or use of natural resources and must coordinate their activities with the CEV, as appropriate.

The INRMP Working Group consists of the key base and host unit personnel, and assumes an oversight role to ensure the effective implementation of this INRMP. Top- and middle-level management representation, as well as representation from individuals with day-to-day, on-base field experience, will provide the INRMP Working Group with the leadership and structure necessary for successful implementation.

Although HARB personnel are responsible for implementing the INRMP, additional sources of support may be utilized. These include temporary labor, seasonal employees (e.g., grounds maintenance summer hires), private contractors, state and Federal agencies, private organizations, and universities. Using these resources is the most efficient and cost-effective method for acquiring expertise on a temporary basis.

9.3 Annual INRMP Review and Coordination Requirements

The INRMP is reviewed on a regular basis to reflect budgeting and implementation of Plan objectives. The initial draft of the INRMP is reviewed by cooperating agencies, including the USFWS, FFWCC, and NPS. These stakeholders are also invited to participate in an annual review of the natural resources management program. HARB will also complete an Annual Project Tracking Sheet, included in Appendix A, to track when projects are implemented.

9.4 Monitoring INRMP Implementation

Monitoring and evaluation are at the heart of the INRMP's adaptive management approach and serve as a check mechanism for the implementation of the INRMP. Although the INRMP

establishes direction for the next 5 years, more time may be needed to achieve some of the goals and objectives. Monitoring will determine whether:

- Projects are implemented in compliance with the INRMP, AFI, and DoD requirements
- Goals and objectives described in Chapter 8 are met
- Assumptions, relationships, and decisions are valid considering new information or changing condition.

Two types of monitoring are pertinent to this INRMP: implementation and effectiveness. Implementation monitoring is the most basic level of monitoring, which determines whether projects and activities outlined in the INRMP are being implemented. HARB will complete an Annual Project Tracking Sheet, included in Appendix A, to track when projects are implemented. Effectiveness monitoring determines whether projects and activities are designed and conducted in compliance with the INRMP and other direction.

This Page Intentionally Left Blank

TABLE 9-1
Summary of Proposed Management Actions and Priorities
HARB Integrated Natural Resources Management Plan

Activity	Priority Classification	Funding Source	Legal Driver	Cost Estimate
Goal 1				
Project 1.1.1: Maintain a wetland inventory and monitoring program	0	ENV	EO 11990	1 FTE, 2 days annually
Project 1.1.2: Update the jurisdictional wetland delineation for any project where wetlands are proposed to be affected	0	ENV	EO 11990	Cost will be project-specific
Project 1.1.3: Periodically remove accumulated debris and sediments from outfall culverts	1	ENV	AFI 32-7041	2 FTE, 4 days annually
Project 1.1.4: Monitor water quality in wetland areas	0	ENV	EO 11990, AFI 32-7041, AFI 32-7064	2 FTE, 1 day quarterly plus lab analysis fees
Project 1.1.5: Develop a wetland mitigation policy and procedures to address planned or proposed development actions	2	ENV	CWA, EO 11990, AFI 32-7064	Cost will vary depending on proposed development actions
Project 1.1.6: Update the wetland mitigation policy and procedures based on new information and guidelines	0	ENV	CWA, EO 11990, AFI 32-7064	1 FTE, 2 days annually or as new information is available
Project 1.1.7: Continue to implement and review annually (update as needed) the SWPPP	0	ENV	CWA	I FTE, 3 days annually
Project 1.1.8: Continue groundwater monitoring activities at IRP sites, as scheduled	0	ENV	IRP requirements	Funded through the IRP program
Project 1.1.9: Continue to evaluate potential water conservation measures for HARB	3	ENV	EO 12902	1 FTE, 1 week annually
Project 1.2.1: Prepare and implement a Landscape Management Plan	2	ENV	EO 13148, USC 2814, EO 13112, AFI 32-7064, EO 12902	Estimated $50/hour contractor support
Project 1.2.2: Prepare and implement a Wildfire Management Plan	2	ENV	USC 2814, EO 13112, AFI 32-7064	Estimated $50/hour contractor support
Project 1.3.1: Maintain woody vegetation to prevent height obstructions within airfield	0	ENV	AFI 13-213	Cost will vary depending on maintenance needs

TABLE 9-1
Summary of Proposed Management Actions and Priorities
HARB Integrated Natural Resources Management Plan

Activity	Priority Classification	Funding Source	Legal Driver	Cost Estimate
clear zones, primary surface area, and transitional surfaces				
Project 1.3.2: Maintain herbaceous vegetation near airfields to remove attractants for birds and prevent problems from occurring	0	ENV	AFI 91-212, AFI 91-202	Cost will vary depending on maintenance needs
Goal 2				
Project 2.1.1: Implement the *Pine Rockland Restoration and Management Plan* (Golder, 2012b)	2	ENV	ESA, 16 USC 670a et seq, AFI 32-7064	Costs will be covered by costs to implement Project 2.2.2
Project 2.1.2: Implement management and restoration recommendations and strategies in the *Phantom Lake Improvements and Constraints Study* (Golder, 2013a)	3	ENV	AFI 32-7064, ESA	Estimated $50/hour contractor support over several years, depending on management strategies implemented
Project 2.1.3: Implement management and restoration recommendations and strategies in the *Twin Lakes Feasibility Study* (Golder, 2013b)	3	ENV	AFI 32-7064, ESA	Estimated $50/hour contractor support over several years, depending on management strategies implemented
Project 2.1.4: Develop a Burrowing Owl Management Plan	3	ENV	MBTA	Estimated $50/hour contractor support
Project 2.1.5: Conduct a quantitative fish study	2	ENV	EO 13112, AFI 32-7064	Estimated $50/hour contractor support
Project 2.1.6: Conduct a Military Canal Flora and Fauna Baseline Study	2	ENV	16 USC 670a et seq, AFI 32-7064	Estimated $50/hour contractor support
Project 2.1.7: Conduct an (1) Endemic Butterfly and Dragonfly Survey; (2) Migratory Bird Survey; (3) Qualitative Herpetology Survey; and (4) Qualitative bat survey	2	ENV	16 USC 670a et seq, ESA, AFI 32-7064, MBTA, AFI 91-212	Estimated $50/hour contractor support
Project 2.2.1: Implement management strategies for Small's milkpea and sand flax as outlined in the *Protected Plant Management Plan* (Appendix E)	2	ENV	16 USC 670a et seq, AFI 32-7064, ESA	Costs provided in Appendix E

TABLE 9-1
Summary of Proposed Management Actions and Priorities
HARB Integrated Natural Resources Management Plan

Activity	Priority Classification	Funding Source	Legal Driver	Cost Estimate
Project 2.2.2: Implement the *Protected Plant Management Plan* (Appendix E)	2	ENV	16 USC 670a et seq, AFI 32-7064, ESA	Costs provided in Appendix E; some of the costs will be covered by Project 2.2.1
Project 2.2.3: Conduct reconnaissance surveys to update the presence and distributions of listed T&E species and their habitats	2	ENV	16 USC 670a et seq, AFI 32-7064, ESA	Estimated $50/hour contractor support per survey depending on species and extent
Project 2.2.4: Maintain maps of natural features that occur within the base (wetlands, surface water bodies, natural communities, etc.)	0	ENV	CWA, AFI 32-7064	1 FTE, 1 week annually
Project 2.2.5: For any newly identified federally listed plant and animal species on HARB, coordinate with AFCEC and HQ AFRC to evaluate the need for modifications or initiation of habitat conservation plans	0	ENV	ESA	Costs would be specific to organism(s) identified
Project 2.2.6: Review information from resources agencies, as available, regarding the status for T&E species in the region	1	ENV	16 USC 670a et seq, AFI 32-7064, ESA	1 FTE, 1 week annually or as new information is available
Project 2.2.7: Routinely review the BASH-potential database maintained at HARB for occurrences of any listed SSC	0	ENV	AFI 91-212	1 FTE, 1 week annually or as new information is available
Project 2.2.8: Update the *Threatened and Endangered Species Survey and Management Plan* (e^2M, Inc. 2005a)	2	ENV	16 USC 670a et seq, AFI 32-7064, ESA	Estimated $50/hour contractor support
Project 2.3.1: Prepare an Updated IESMP	2	ENV	USC 2814, EO 13112, AFI 91-202, AFPM 91-212	Estimated $50/hour contractor support
Project 2.3.2: Evaluate the feasibility of enhancing the natural functions of the Grenade Range and Reserves areas through the removal of invasive and exotic plant species	1	ENV	USC 2814, EO 13112, AFI 32-7064, ESA	Estimated $50/hour contractor support
Project 2.4.1: As a BASH reduction measure, evaluate the reduction or elimination of	1	ENV	EO 13112, AFI 91-202, AFPM 91-212	1 FTE, 1 week

TABLE 9-1
Summary of Proposed Management Actions and Priorities
HARB Integrated Natural Resources Management Plan

Activity	Priority Classification	Funding Source	Legal Driver	Cost Estimate
nuisance wildlife attractants (e.g., fruit-bearing trees)				
Project 2.4.2: Control fire ant colonies, rodents, and other pests on the grounds of the base	0	ENV	N/A	Estimated $50/hour contractor support
Project 2.4.3: Conduct a radio-tracking survey of large mammals (e.g., coyotes, foxes, etc.) populations at HARB; implement measures to control populations that may conflict the military mission	0	ENV	AFI 91-212, AFI 91-202	Estimated $50/hour contractor support
Project 2.4.4: Implement removal and management practices outlined in the *Homestead ARB Caiman Removal Feasibility Study* (AMEC, 2012)	0	ENV	ESA, EO 13112	Estimated $50/hour contractor support
Project 2.4.5: Implement initiatives to minimize and control invasive and exotic plants species and the exotic caiman within the habitats that are required for alligator populations	1	ENV	USC 2814, EO 13112, AFI 32-7064, ESA	Estimated $50/hour contractor support for exotic plant species control; Caiman costs covered by Project 2.4.4
Project 2.4.6: Conduct a radio-tracking survey of Crocodilian species at HARB	2	ENV	EO 13112, AFI 32-7064, ESA	Estimated $50/hour contractor support
Goal 3				
Project 3.1.1: Develop a working team at HARB to integrate the concepts in the INRMP into existing plans and programs at the installation.	1	ENV	AFI 32-7064	2 FTE, 1 week annually or as new projects are proposed
Project 3.1.2: Continue the work of the HARB ESOHC	1	ENV	32 CFR 989	Cost will vary depending on proposed projects
Project 3.1.3: For new projects, determine the need for compliance with Florida Coastal Zone Management Program	0	ENV	CZMA	Cost will vary depending on proposed projects

TABLE 9-1
Summary of Proposed Management Actions and Priorities
HARB Integrated Natural Resources Management Plan

Activity	Priority Classification	Funding Source	Legal Driver	Cost Estimate
Project 3.2.1: Develop a T&E species training course for HARB personnel and contractors	2	ENV	AFI 32-7064	Estimated $50/hour contractor support
Project 3.2.2: Develop an invasive species training course for HARB personnel and contractors	2	ENV	AFI 32-7064, EO 13112, USC 2814	Estimated $50/hour contractor support
Project 3.2.3: Provide information about HARB's natural resources using pamphlets, flyers, command units, and the internet	1	ENV	AFI 32-7064	Estimated $50/hour contractor support, portion of costs covered by Projects 3.2.1 and 3.2.2
Project 3.2.4: Identify projects or use public events (e.g., Earth Day) to offer hands-on training and individual participation in activities to better demonstrate the concept, application, and importance of conservation and ecosystem management	1	ENV	AFI 32-7064	1 FTE, 3 days annually
Project 3.2.5: Establish a "Living Laboratory" pine rockland for in conjunction with the nearby Air Base Elementary School along SW 288th Street	3	ENV	N/A	Estimated $50/hour contractor support
Project 3.3.1: Identify programs to promote stewardship plans, foster conservation awareness, and provide or receive technical assistance	1	ENV	AFI 32-7064	1 FTE, 1 week annually
Project 3.3.2: Monitor changes to and actions completed for ecosystem management initiatives undertaken by the government and non-government entities.	0	ENV	Sikes Act, AFI 32-7064	1 FTE, 2 days annually or as new information is available
Project 3.3.3: Evaluate consultation with AFCEE, HQ AFRC, and the Miami-Dade County DERM for development of conservation plans and plant/wildlife studies	1	ENV	AFI 32-7064	1 FTE, 1 week

Notes: FTE = full-time equivalent

Chapter 10 Appendix

The following documents are included as appendices:

- BASH Plan (Appendix C)
- Integrated Pest Management Plan (Appendix D)
- Protected Plant Management Plan (Appendix E)
- Statement of Work for Grounds Maintenance of the Cantonment and Munitions Area (Appendix F)
- Florida Bonneted Bat Management Plan (Appendix G)

Chapter 11 References

Air Force Instructions

United States Air Force (USAF), April 1999, AFI 32-1053, “Pest Management Program,” Air Force Instruction.

United States Air Force (USAF), December 2003, AFI 32-7041, “Water Quality Compliance,” Air Force Instruction.

United States Air Force (USAF), June 2004, AFI 32-7065, “Cultural Resources Management,” Air Force Instruction.

United States Air Force (USAF), September 2004, AFI 32-7064, “Integrated Natural Resources Management,” Air Force Instruction.

United States Air Force (USAF), March 2005, AFI 90-801, “Environment, Safety, and Occupational Health Councils”, Air Force Instruction.

United States Air Force (USAF), April 2009, AFI 32-7042, “Waste Management,” Air Force Instruction.

United States Air Force (USAF), February 2014, AFI 32-2001, “Fire Emergency Services Program,” Air Force Instruction.

United States Air Force (USAF), February 2004, AFI 91-212, “Bird/Wildlife Aircraft Strike Hazard (BASH) Management Techniques,” Air Force Instruction.

United States Air Force (USAF), November 2011, AFI 32-7001, “Environmental Management,” Air Force Instruction.

United States Air Force (USAF), August 2013, AFI 91-202, “The U.S. Air Force Mishap Prevention Program,” Air Force Instruction.

United States Air Force (USAF), August 1997, AFI 13-213, “Airfield Management,” Air Force Instruction.

U. S. Government Agency Publications

United States Department of Defense (DoD), May 2008, United States Department of Defense Instruction (DoDI) 4150.7, “Pest Management Program.”

United States Department of Defense (DoD), December 2006, United States Department of Defense Instruction (DoDI) 6055.6, “DoD Fire and Emergency Services (F&ES) Program.”

United States Government Printing Office, United States Code of Federal Regulations, Title 40, Chapter I—Environmental Protection Agency, Part 171, “Certification of Pesticide Applicators,” Section 9.

Executive Orders

The White House Press Office, 1997, Executive Order No. 11990, Protection of Wetlands, May 1997.

The White House Press Office, 1994, Executive Order No. 12902, Energy Efficiency and Water Conservation at Federal Facilities, March 1994.

The White House Press Office, 1999, Executive Order No. 13112, Invasive Species, February 1999.

The White House Press Office, 2000, Executive Order No. 13148, Greening the Government through Leadership in Environmental Management, April 2000.

The White House Press Office, 2007, Executive Order No. 13423, Strengthening Federal Environment, Energy, and Transportation Management, January 2007.

The White House Press Office, 2009, Executive Order No. 13514, Federal Leadership in Environmental, Energy, and Economic Performance, October 2009.

State of Florida

Florida Administrative Code (F.A.C.), 1996, Chapter 62-621.300[5], Florida Department of Environmental Protection, Section 300 Permits.

Florida Administrative Code (F.A.C.), 1999, Chapter 5B Florida Department of Agriculture and Consumer Services, Section 40 Preservation of Native Flora of Florida.

Florida Administrative Code (F.A.C.), 1999, Chapter 62 Department of Environmental Protection, Section 340 Delineation of the Landward Extent of Wetlands and Surface Waters.

Florida Statutes, 2002, Title XXXII Regulation of Professions and Occupations, Chapter 482 Structural Pest Control Act.

Miami-Dade County Code, Chapter 24, Environmental Protection, Codified through Ordinance No. 02-46, enacted April 9, 2002.

Other Cited Sources

482nd Fighter Wing 91-212, September 2006, 482nd Fighter Wing Bird-Aircraft Strike Hazard Reduction (BASH) Program, U.S. Department of the Air Force, 482nd Fighter Wing (AFRC), Homestead, Florida.

AECOM. 2009. Wetlands Removal/Modification Feasibility Study, Homestead Air Reserve Base, Dade County, FL. November 2009.

AECOM. 2012. Homestead Air Reserve Base Final Jurisdictional Wetland Report. July 20.

Agency for Toxic Substances and Disease Registry (ATSDR). 1998. Public Health Assessment, Homestead Air Force Base. http://www.atsdr.cdc.gov/hac/pha/pha.asp?docid=188&pg=0. September 30.

Air Combat Command (ACC). 1992. Alternative Concept Base Development Plans, Homestead Air Force Base, Florida. December 11.

Air Force Base Conversion Agency (AFBCA). 2002. *Restoration Update* Newsletter. July.

Air Force Center for Environmental Excellence (AFCEE). 2001. Preliminary Assessment/Remedial Design Contract Final Focused Feasibility Study for Operable Unit 11 at Homestead Air Force Base, Florida. November.

Air Force Reserve Command (AFRC). 1997. Final Fish and Wildlife Management Plan, Homestead Air Reserve Station. May.

Air Force Reserve Command (AFRC). 2008a. Final Integrated Pest Management Plan for Homestead Air Reserve Base.

Air Force Reserve Command (AFRC). 2008b. Integrated Solid Waste Management Plan for Homestead Air Reserve Base, Florida.

Air Force Reserve Command (AFRC). 2009. Hazardous Materials Emergency Planning and Response Plan for Homestead Air Reserve Base, Florida.

Allen, Arthur W. 1986. Habitat Suitability Index Models: Mink, Biological Report 82. U.S. Fish and Wildlife Service.

AMEC Environmental & Infrastructure, Inc. (AMEC). 2012. Homestead ARB Caiman Removal Feasibility Study. September 2012.

Argonne National Laboratory (Argonne). 1997. Endangered, Threatened, and Rare Plants of Homestead Air Reserve Base. October.

Best, T., Kiser, W., and Rainey, J. 1997. *Eumops glaucinus, American Society of Mammalogists*, No. 551, pp. 1-6. May.

Bradley, K. A. and G. D. Gann. The Institute for Regional Conservation. 1999. Status Summaries of 12 Rockland Plant Taxa in Southern Florida. October 27, 1999.

Bradley, K., and J. Possley. The Institute for Regional Conservation. 2002. Conservation Action Plan for Galactia smallii. In Maschinski, J., M.Q.N. Fellows, J. Fisher, C. Lane, M. Fidelibus, S. Wright, P. Anderson, G. Guala, J. Pipoly, and J. Possley. Conservation of south Florida endangered and threatened flora: Final Report to the Endangered Plant Advisory Council, FDACS Contract #006466. Florida Department of Agriculture and Consumer Services, Division of Plant Industry, Gainesville, Florida.

Butterfield, B.P., Meshaka, Jr., W.E. and Guyer, C. 1997. "Nonindigenous Amphibians and Reptiles" in *Strangers in Paradise, Impact and Management of Nonindigenous Species in Florida*, pages 123-138. Island Press.

Cassani, J.R. 1995. *Problems and Prospects for Grass Carp as a Management Tool*. American Fisheries Society Symposium 15: 407-412, 1995.

Causaras, Carmen R. 1987. Geology of the Surficial Aquifer System, Dade County, Florida, U.S. Geological Survey Water Resources Investigations Report 86-4126.

Cox, J., Kautz, R., Maclaughlin, M., and Gilbert T. 1994. Closing the Gaps in Florida's Wildlife Habitat Conservation System.

Dalrymple, G. H. 1994. Non-indigenous amphibians and reptiles. Pages 67-71, 73-78 in D. C. Schmitz and T. C. Brown, project directors. An assessment of invasive non-indigenous species in Florida's public lands. Florida Department of Environmental Protection Technical Report No. TSS-94-100, Tallahassee, Florida, USA.

Deyrup, M. and R. Franz. 1994. *Rare and Endangered Biota of Florida, Volume IV Invertebrates*.

e^2M, Inc. 2005a. Threatened and Endangered Species Survey and Management Plan for Homestead Air Reserve Base, Homestead, Florida. June 2005.

e^{2}M, Inc. 2005b. Invasive and Nonnative Species Survey and Management Plan for Homestead Air Reserve Base, Homestead, Florida. June 2005.

Ellis, T.M. 1980. *Caiman Crocodilus*: An Established Exotic in South Florida. *Copeia*, 1980: 152-154.

Federal Emergency Management Agency (FEMA). 2009. Flood Insurance Rate Map; Map Numbers: 12086C0594L, 12086C0613L, 12086C0732L, 12086C0755L. September 11, 2009.

Ferriter A. 1997, Brazilian Pepper Management Plan for Florida, a report from the Florida Exotic Pest Plant Council's Brazilian Pepper Task Force, July 1997.

Fish, Johnnie E. and Stewart, Mark. 1991. Hydrogeology of the Surficial Aquifer System, Dade County Florida, U. S. Geological Survey Water Resources Investigations Report 90-4108.

Florida Department of Environmental Protection (FDEP). 2012. Florida Coastal Management Program. http://www.dep.state.fl.us/cmp/about.htm. Accessed January 15, 2014.

Florida Fish and Wildlife Conservation Commission (FFWCC). 2012. Tegus in Florida brochure. www.myfwc.com/media/2380549/Tegu-brochure.pdf, accessed January 16, 2014.

Florida Fish and Wildlife Conservation Commission (FFWCC). 2014. Grass Carp: *Ctenopharyngodon*. http://myfwc.com/wildlifehabitats/profiles/fish/freshwater/nonnatives/grass-carp/, accessed January 16, 2014.

Florida Natural Areas Inventory (FNAI). 2000. Sand Flax *Linum arenicola*.

Florida Natural Areas Inventory (FNAI). 2001. Field Guide to Rare Animals in Florida – Florida burrowing owl *Athene cunicularia floridana*.

Florida Natural Areas Inventory (FNAI). 2002. Managed Areas in the State of Florida database.

Florida Natural Areas Inventory (FNAI). 2010. Guide to the natural communities of Florida: 2010 edition. Florida Natural Areas Inventory, Tallahassee, FL.

Florida Natural Areas Inventory (FNAI). 2013. FNAI Tracking List – Miami-Dade County. http://www.fnai.org/bioticssearch.cfm, accessed October 21, 2013.

Friers, Joshua. 2014. Personal communication with Sara Kent/CH2M HILL. January 15, 2014.

Fuller, P.L. and Benson, A.J. 2013. *Nonindigenous Species Introduced into South Florida*, U.S. Geological Survey. http://sofia.er.usgs.gov/sfrsf/rooms/species/invasive/intro.

Fuller, P.L. and Nico, L.G. 1999. Nonindigenous Fishes of Florida with a Focus on South Florida, poster presentation by the U.S. Geological Survey, Caribbean Science Center to the South Florida Restoration Science Forum, sponsored by the South Florida Ecosystem Restoration Task Force. http://sofia.usgs.gov/sfrsf/rooms/species/invasive/focus/index.html.

Gandy, David and Rehage, Jennifer. 2013. An Assessment and Inventory of Fishes at the Homestead Air Reserve Base, Homestead, Florida. July.

Gilbert, Carter. 1992. Rare and Endangered Biota of Florida: Volume II, Fishes.

Golder Associates, Inc. 2012a. Homestead Air Reserve Base Pine Rockland Baseline Assessment Report. September.

Golder Associates, Inc. 2012b. Homestead Air Reserve Base Pine Rockland Restoration and Management Plan. September.

Golder Associates. 2013a. Homestead Air Reserve Base Phantom Lake Improvements and Constraints Study. July.

Golder Associates. 2013b. Homestead Air Reserve Base Twin Lakes Feasibility Study. October.

Gude, Andrew. 2002. Personal Communication between U.S. Fish and Wildlife Service, Ecological Services and Carliane Johnson with Ecology and Environment, Inc. October 24.

Hilsenbeck, Richard. 1993. Ecological Survey of Homestead Air Force Base, Florida, Florida Natural Areas Inventory.

Homestead Air Reserve Base (HARB). 2002a. Fish and Wildlife/Threatened and Endangered Species Management Component Plan.

Homestead Air Reserve Base (HARB). 2002b. Wetlands Identification Report and Management Component Plan.

Homestead Air Reserve Base (HARB). 2006a. *HARB Air Field Operations Plan,* HARB Instruction 13-401, Homestead, Florida.

Homestead Air Reserve Base (HARB). 2006b. Base General Plan. December.

Homestead Air Reserve Base (HARB). 2007. Air Installation Compatible Use Zone (AICUZ) Study at Homestead, Florida.

Homestead Air Reserve Base (HARB). 2009a. Integrated Natural Resources Management Plan for Homestead Air Reserve Base, Florida. September 2009.

Homestead Air Reserve Base (HARB). 2009b. Wildland Fire Management Plan, 482nd Fighter Wing, Homestead ARB, Florida.

Homestead Air Reserve Base (HARB). 2012. Draft Storm Water Pollution Prevention Plan for Homestead Air Reserve Base, Florida. December 2012.

The Institute for Regional Conservation and URS Group, Inc. (IRC and URS). 2013. Assessment of The Federally Endangered Small's Milkpea (*Galactia smallii*) and Candidate Sand Flax (*Linum arenicola*) at The Homestead Air Reserve Base, Homestead, Florida.

Kale, Herbert W. II. 1978. *Rare and Endangered Biota of Florida, Birds.*

King, F.W. and Krakauer, T. 1966. The Exotic Herpetofauna of Southeast Florida. *Quarterly Journal of the Florida Academy of Sciences* 29.

LaRoe, E.T., Farris, G.S., Puckett, C.E., Doran, P.D., and Mac, M.J. 1995. Our Living Resources: a report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems.

Leon Levy Native Plant Preserve. 2013. Plant information: Tillandsia flexuosa. http://www.levypreserve.org/Plant-Listings/Tillandsia-flexuosa, accessed October 21, 2013.

Miami-Dade County Department of Environmental Resource Management (DERM). 2002. Florida Pine Rockland: An Endangered Ecosystem. http://www.miamidade.gov/environment/pine-rocklands.asp.

Miami-Dade County Department of Regulatory and Economic Resources (DRER). 2013. Adopted 2015 and 2025 Land Use Plan for Miami-Dade County, Florida. Update March 2013.

Miller, James A. 1990. Ground Water Atlas of the United States: Alabama, Florida, Georgia, and South Carolina, U.S. Geological Survey Report HA 730-G.

Moler, Paul E. 1992. Rare and Endangered Biota of Florida: Volume III, Amphibians and Reptiles.

Natural Resources Conservation Service (NRCS). 1989. The 26 Ecological Communities of Florida.

Natural Resources Conservation Service (NRCS). 1996. Soil Survey of Dade County, Florida. January.

NatureServe. 2013. NatureServe Explorer, Species Quick Search. http://www.natureserve.org/explorer/. Accessed October 21.

Pipalova, I. 2006. *A Review of Grass Carp Use for Aquatic Weed Control and its Impact on Water Bodies*. J. Aquatic Plant Management 44: 1-12, 2006.

Rattner, B.A., Golden, N.H., Pearson, J.B., Cohen, L.J., Garrett, M.A., Ottinger, and Erwin, R.M. 2002. Biological and Ecotoxicological Characteristics of Terrestrial Vertebrate Species Residing in Estuaries. U.S. Geological Survey. http://www.pwrc.usgs.gov/bioeco. Accessed October 23, 2002.

Scott, Thomas M. 1988. The Lithostratigraphy of the Hawthorn Group (Miocene) of Florida, Florida Geological Survey Bulletin No. 59.

Shafland, P. 1999. How Do Some Non-Native Fishes Help Us, poster presentation by the Florida Non-Native Fisheries Laboratory to the South Florida Restoration Science Forum sponsored by the South Florida Ecosystems Restoration Task Force. http://sofia.usgs.gov/sfrsf/rooms/species/invasive/focus/index.html.

Spreyer, Mark F. and Bucher, Enrique H. 1998. *The Birds of North America*, No. 322.

Sullivan, Janet. 1996. Mustela vison, in: U.S. Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, Fire Effects Information System. http://www.fs.fed.us/database/feis/. Accessed September, 2002.

URS. 2012. Draft Inventory of Facilities to Evaluate Eligibility for Listing in the National Register of Historic Places Homestead Air Reserve Base, Dade County, Florida. November 2012.

U.S. Air Force (USAF). 2006. 482nd Fighter Wing Bird-Aircraft Strike Hazard Reduction (BASH) Program. September.

U.S. Air Force Civil Engineer Support Agency (USAFCESA). 2008. Unified Facilities Criteria (UFC) 3-260-01 Airfield and Heliport Planning and Design. November.

U.S. Air Force and Federal Aviation Administration (USAF and FAA). 2000. Final Supplemental Environmental Impact State for the Disposal of Portions of the Former Homestead Air Force Base. December.

U.S. Air Force and Federal Aviation Administration (USAF and FAA). 2001. Second Supplemental Record of Decision for the Disposal of Portions of the Former Homestead Air Force Base. January 15.

U.S. Army Corps of Engineers (USACE). 1987. Wetlands Delineation Manual Technical Report Y-87-1.

U.S. Army Corps of Engineers (USACE). 1998. Draft Military Canal Special Study Report. June.

U.S. Army Corps of Engineers (USACE). 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plan Region (Version 2.0). November 2010.

U.S. Census Bureau (USCB). 1990. 1990 Census Population and Housing. http://censtats.census.gov/cgi-bin/pl94/pl94data.pl. Accessed November 5, 2013.

U.S. Census Bureau (USCB). 2013a. DP-1 Profile of General Demographic Characteristics: 2000, American FactFinder. http://factfinder2.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t. Accessed November 5, 2013.

U.S. Census Bureau (USCB). 2013b. DP-1 Profile of General Population and Housing Characteristics: 2010, American FactFinder. http://factfinder2.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t. Accessed November 5, 2013.

U.S. Department of Agriculture (USDA). 2002. Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, Fire Effects Information System. http://www.fs.fed.us/database/feis/. Accessed September.

U.S. Environmental Protection Agency (USEPA). 2002. Sole Source Aquifer Protection Program. http://www.epa.gov/safewater/ssanp.html. Accessed August 19.

U.S. Fish and Wildlife Service (USFWS). 1994. Endangered and Threatened Species of the Southeastern United States, "The Red Book."

U.S Fish and Wildlife Service (USFWS). 1999. South Florida Multi-Species Recovery Plan: A Species Plan…An Ecosystem Approach.

U.S. Fish and Wildlife Service (USFWS). 2002. Threatened and Endangered Species System (TESS), Environmental Conservation Online System. http://www.fws.gov/ecos/ajax/tess_public/.

U.S. Geological Survey (USGS). 2012. Land Cover Trend Project – Southern Florida coastal Plain. http://landcovertrends.usgs.gov/east/eco76Report.html, accessed September 10, 2013

White, W.A. 1970. *The Geomorphology of the Florida Peninsula*, Florida Geological Survey, Florida Geological Bulletin No. 51.

Wunderlin, R.P and B.F. Hansen. 2011. Guide to the Vascular Plants of Florida. University of Florida Press. Third Edition.

Appendix A
Projects

Appendix A: Projects

Project 1.1.1: Maintain a wetland inventory and monitoring program to assess wetland functions and values over time. Wetlands provide water filtration functions and provide suitable habitat for a variety of plant and animal species. Wetland monitoring would include general observations of vegetation, wildlife, and exotic species. Inventory and wetland monitoring will occur quarterly.

Project 1.1.2: Update the jurisdictional wetland delineation for any project where wetlands are proposed to be affected. Wetlands will be delineated using the USACE 1987 Manual and the Atlantic and Gulf Coast Plain Regional Supplement (USACE, 2010). Wetlands will be mapped using GIS and verified by the USACE.

Project 1.1.3: Periodically remove accumulated debris and sediments from outfall culverts to enhance circulation and settling properties. The outfalls occur along the boundary canal, Military Canal, and within the lakes and stormwater pond.

Project 1.1.4: Monitor water quality in wetland areas to determine their ability to perform wetland functions (i.e., runoff filtration and retention, groundwater recharge, and other water quality/water supply benefits). Water quality monitoring would be focused on nutrient and sediment loading.

Project 1.1.5: Using the results of wetland assessments and field surveys, develop a wetland mitigation policy and procedures to address planned or proposed development actions and the regulatory requirement to offset impacts. The mitigation policy and procedures will be consistent with USACE and USEPA wetland mitigation guidance.

Project 1.1.6: Periodically update the wetland mitigation policy and procedures based on new information and guidelines adopted by DoD, USAF, and regulatory agencies. Incorporate appropriate measures to address regulatory changes that change requirements for mitigation.

Project 1.1.7: Continue to implement and review annually (update as needed) the SWPPP for HARB to reflect changes in BMPs; training, inspection, sampling, monitoring, and training protocol; and to address changes in industrial activities. The BMPs and other protocols outlined in the SWPPP aim to protect groundwater, wetlands, and other water bodies at HARB.

Project 1.1.8: Continue groundwater monitoring activities at IRP sites, as scheduled. Long-term monitoring for groundwater contamination is ongoing at 4 CERCLA sites (OU-7, OU-11T, OU-15, and OU-18) and two POL sites (SS-2A and SS-15A). Groundwater is extremely shallow at HARB, and groundwater percolates and discharges to the water bodies on base. Groundwater monitoring determines the nature and extent of the contamination and indentifies if contamination has reached water sources such as wetlands. Groundwater contamination has the potential to affect the habitat and populations of aquatic plants and animals at HARB. In the event contamination reaches or nears water sources, appropriate remedies would be enacted to contain and control the contamination.

Project 1.1.9: Continue to evaluate potential water conservation measures for HARB related to supply and demand, conservation, landscaping, and education and training. Explore consultation with AFCEC, HQ AFRC, and SFWMD.

Project 1.2.1: Prepare and implement a Landscape Management Plan using the principles of xeriscaping, including the use of native species in the design of the plan. Ensure that BASH issues are considered in the plan. Maintenance costs for grass mowing, trimming, and edging as well as environmental concerns, including water conservation and water quality protection, have increased the need for implementation of environmentally beneficial landscaping. A principal component of the management plan will be to establish guidelines and procedures for xeriscaping. Xeriscaping practices employ the use of native plant species, which have been shown to reduce maintenance costs and provide an overall benefit to the environment. Baseline conditions and monitoring procedures will be established in the plan.

Project 1.2.2: Prepare and implement a Wildfire Management Plan, and integrate wildfire management concepts into the overall grounds maintenance program. Unplanned wildfires can have catastrophic effects on human safety, mission capabilities, and rare natural resources. The purpose of developing the WFMP is to reduce wildfire potential, protect property, protect and enhance valuable natural resources, and implement ecosystem management goals and objectives on HARB. The WFMP will directly support the military mission and will be consistent with installation emergency operations plans.

Project 1.3.1: Maintain woody vegetation to prevent height obstructions within airfield clear zones, primary surface area, and transitional surfaces. Monitor clear zones to proactively identify regeneration of woody vegetation, implement appropriate control/removal measures, and prevent problems from occurring. Maintaining woody vegetation complies with the BASH plan and AICUZ.

Project 1.3.2: Maintain herbaceous vegetation near airfields to remove attractants for birds and prevent problems from occurring. Herbaceous vegetation will be mowed and maintained on HARB to prevent bird attractants. Mowing will comply with the guidance outlined in the BASH plan and with the grounds maintenance SOW.

Project 2.1.1: Implement the *Pine Rockland Restoration and Management Plan* (Golder, 2012b). Explore potential partnership opportunities with other entities involved in the restoration of Remnant Pine Rockland ecosystems in south Florida. Pine rocklands are an endangered ecosystem in Florida. The Remnant Pine Rockland area includes the endangered habitat, and HARB proposes to restore the area to natural conditions. Strategies outlined in the *Pine Rockland Restoration and Management Plan* include removing exotic plants and animals, reintroducing extirpated species, preventing pollution, and various maintenance and monitoring procedures.

Project 2.1.2: Implement management and restoration recommendations and strategies in the *Phantom Lake Improvements and Constraints Study* (Golder, 2013a). Phantom Lake is a manmade feature with no direct connection to the Boundary Canal System. The lake includes marsh habitat and supports a variety of wading birds, aquatic wildlife, and plants. The shoreline also includes pine rockland habitat. The management strategies outlined in the *Phantom Lake Improvements and Constraints Study* include restoring and maintaining the marsh habitat within the lake, adding nutrients to the lakes subsurface soils, removing exotic species, and restoring the surrounding pine rockland habitat.

Project 2.1.3: Implement management and restoration recommendations and strategies in the *Twin Lakes Feasibility Study* (Golder, 2013b). The Twin Lakes area consists of two deepwater borrow lakes with an emergent wetland fringe. The two lakes are separated by berm,

except during high water events when the waters from the lakes overtop the berm. The lakes discharge to the Boundary Canal System through a 20-inch diameter culvert. The management strategies outlined in the *Twin Lakes Feasibility Study* include restoring and maintaining marsh habitat within the lake, adding nutrients to the lakes subsurface soils, and removing exotic species from the shoreline.

Project 2.1.4: Incorporate management strategies for Florida bonneted bat into conservation programs for natural communities. HARB will integrate FBB conservation into management of natural resources on the installation in accordance with the FBB Management Plan (Appendix G).

Project 2.1.5: Develop a Burrowing Owl Management Plan that includes: (a) flagging burrows (with signs) during the nesting season and/or map them to highlight areas where buffer distances for activities are required; (b) distributing information on this species to HARB personnel who may work in or near these sensitive areas; (c) conducting qualitative surveys of active burrows during nesting season, as funds are available.

Project 2.1.6: Conduct a quantitative fish study. Identify the fish communities and habitat quality present in aquatic systems on HARB. Identify potential stressors on fish communities. Investigate management approaches to improve habitat for native species. The fish communities on HARB serve as indicators for the overall health of the aquatic system. Biological monitoring of fish communities will generate information on potential water quality and habitat stressors. Data from the study would be incorporated into planning and management strategies, as appropriate. The study would provide information on the spread and status of invasive and exotic fish species at HARB. This information would be included in the revised IESMP and used to develop appropriate control strategies. Previous fish studies focused on number of species, while this study would focus on the abundance of each species on HARB.

Project 2.1.7: Conduct a Military Canal Flora and Fauna Baseline Study to evaluate the populations and distribution of flora and fauna within the Military Canal. Investigate management approaches to improve habitat for native species. Military Canal contains a variety of native and exotic plant species and a variety of exotic fish and native wildlife species that compete for resources. This study would be consistent with the regional plans and programs and would lessen the potential that HARB would inadvertently become a source of exotic fish and plant species within the drainage system of south Miami-Dade County. Major issues to be addressed include restoration of native fish populations and minimizing the potential to increase BASH strikes. Data from the survey could be used to adapt and implement management strategies and manage protected species if identified during the survey.

Project 2.1.8: Conduct the following reconnaissance surveys to identify animal species present on HARB:

1) **Endemic Butterfly and Dragonfly Survey**: Several species of butterflies and dragonflies are endemic to south Florida, particularly the pine rockland habitats. A survey would be conducted to determine the types of butterfly species present on HARB. The study would provide information on species and their habitat use on HARB. The study would focus on butterfly species known to occur in pine rockland habitat, which includes the Florida leafwing butterfly (*Anaea troglodyta floridalis*) and Bartram's hairstreak butterfly (*Strymon acis bartrami*). Both of these species were proposed for listing under ESA in August 2013. Information from the study could be used to direct management of specific habitats utilized by butterfly species on HARB as well as provide conservation measures to avoid or minimize adverse impacts to

identified species. Data from the study would be used to supplement and update existing natural resource management plans on HARB.

2) **Migratory Bird Survey**: Two surveys, one in the spring and one in the fall, would be conducted to determine the types of migratory bird species present on HARB. The study would provide information on the species and associated natural habitat present on HARB. Information from the study could be used to direct management of specific habitats utilized by migratory bird species on HARB as well as provide conservation measures to avoid adverse impacts to identified species. Data from the study would be used to supplement and update existing natural resource management plans on HARB and the BASH plan.

3) **Qualitative Herpetology Survey**: A survey would be conducted to determine the types of amphibian and reptile species present on HARB. The study would provide information on the species and their habitat use on HARB. Information from the study could be used to direct management of specific habitats utilized by amphibian and reptile species on HARB, as well as to provide conservation measures to avoid or minimize adverse impacts to identified species. Data from the study would be used to supplement and update the INRMP.

4) **Qualitative Bat Survey**: Populations of Florida bat species are becoming more imperiled and more species are becoming listed, including the Florida bonneted bat. A survey would be conducted to determine the types of bat species present on HARB. The study would provide information on the species and their habitat use on HARB. Information from the study could be used to direct management of specific habitats utilized by bat species on HARB as well as provide conservation measures to avoid adverse impacts to identified species. Data from the study would be used to supplement and update existing natural resource management plans on HARB. See Appendix G for draft study plan.

Project 2.2.1: Implement management strategies for Small's milkpea and sand flax, as outlined in the *Protected Plant Management Plan* (Appendix E). The management strategies generally include removing exotic and invasive plants, mowing, propagating native pine and grass species, collecting/distributing seed, and monitoring populations.

Project 2.2.2: Implement the *Protected Plant Management Plan* (Appendix E), which includes restoring endangered pine rockland habitat at HARB and providing suitable habitat for federally protected species (Appendix E). Federally listed plant species associated with pine rockland habitat have been identified on HARB. Multiple state-protected plant species also have been documented on HARB. A management plan to protect and maintain habitat for these rare plants would better enable HARB to sustain these rare plant populations. The plan focuses on measures to manage habitat for Small's milkpea, sand flax, and other state-protected plant species occurring on HARB. The PPMP is used to supplement and update the INRMP. The plan would be adapted if new protected species are found within HARB or if management needs change.

Project 2.2.3: Work with the USFWS to identify and implement management strategies for Florida bonneted bat foraging and roosting habitat. As monitoring data is gathered (Objective 2.1.8-4), management strategies that protect bat foraging and roosting habitat and enable the military mission will be developed and implemented.

Project 2.2.4: Conduct reconnaissance surveys to update information regarding the presence and distributions of listed T&E species and their habitats at a minimum of every 5 years, completed in the year prior to INRMP review/revision, if possible. Results of the surveys will be used to develop potential projects and revise management strategies for INRMP update.

Project 2.2.4: Maintain maps of natural features that occur within the base (wetlands, surface water bodies, natural communities, etc.). The maps will be used to: (a) Increase awareness of HARB personnel about the location and importance of natural features and T&E species on the installation; (b) Provide information to installation personnel on conservation measures that can be implemented to avoid adverse impacts to protected species and their habitats; and (c) Identify baseline conditions for comparison purposes in order to monitor HARB efforts for providing conservation management of habitats for protected species and for preparation of endangered species management plan(s).

Project 2.2.5: For any newly identified federally listed plant and animal species on HARB, coordinate with AFCEC and HQ AFRC to evaluate the need for modifications or initiation of habitat conservation plans. Evaluate the compatibility of restoration efforts with the BASH reduction objectives.

Project 2.2.6: Review information from resources agencies, as available, regarding the status for T&E species in the region. Determine whether special requirements for T&E species surveys are needed and whether changes in survey frequency are warranted.

Project 2.2.7: Routinely review the BASH-potential Database maintained at HARB for occurrences of any listed species of special concern. As species of special concern are identified in the Bash-potential Database, develop measures to minimize the potential for these species to occur in areas where air strikes would be probable. Measures developed will be consistent with BASH Plan and with Project 1.3.2.

Project 2.2.8: Update the *Threatened and Endangered Species Survey and Management Plan* (e^2M, Inc. 2005a). The plan will incorporate the populations of Small's milkpea and sand flax identified at HARB along with other protected species identified.

Project 2.3.1: Prepare an Updated Invasive and Exotic Species Management Plan (IESMP) consistent with the direction and intent of Section 2 of EO 13112. Invasive and exotic species at HARB have significantly degraded native habitat by crowding out important native species. The invasive and exotic species problem is not unique to HARB but is typical of much of the surrounding area. Besides threatening the native communities that remain on HARB, the invasive and exotic species problem contributes to increased flooding and creates potential fire hazards. The IESMP will consist, at a minimum, of nine component plans, as directed by the EO. The component plans will be coordinated and integrated with the INRMP. The updated IESMP will include a comprehensive survey of the base to identify and prioritize problem areas for invasive species removal/control. Prioritization of areas will be based upon safety impacts to the military mission of the base, the potential for catastrophic fire, flooding, and the potential to interfere with existing native communities or restoration efforts. The IESMP will address exotic and invasive species management throughout the base. Special management will be addressed within the context of removal and control. Invasive and exotic species removal, control, monitoring, and prevention strategies will be addressed within the plan. It is expected that this plan will be dynamic in that it will require regular updates to: (1) include the "lessons learned" at HARB for the removal and control of species and (2) take into account emerging invasive and exotic species management initiatives outside the boundaries of HARB. For the IESMP, HARB will consider working with the NPS, USDA-APHIS, etc. to implement the plan to rid HARB of

exotic vegetation.

Project 2.3.2: Evaluate the feasibility of enhancing the natural functions of the Grenade Range and Reserves areas through the removal of invasive and exotic plant species. The Grenade Range and Reserves area was historically pine rockland habitat. As part of the PPMP, HARB is proposing to restore the habitat to enhance protected species populations.

Project 2.4.1: As a BASH reduction measure, evaluate the reduction or elimination of nuisance wildlife attractants (e.g., fruit bearing trees) to reduce the incidence of exotic parrot flocks and iguanas frequenting the base. Many of the fruit bearing trees are exotic species and removal would also enhance natural communities at HARB.

Project 2.4.2: Control fire ant colonies, rodents, and other pests on the base through continued implementation of the Integrated Pest Management Program. These pests pose threats to natural resources as well as human health risks and control is consistent with management for native species.

Project 2.4.3: Conduct a radio-tracking survey of large mammals (ex: bobcats, coyotes, and foxes) occurring on HARB. The study would provide information on the various large mammal species that occur on HARB. Results from the study would be used to develop and implement measures to control these nuisance large mammal populations that may conflict the military mission.

Project 2.4.4: Implement removal and management practices outlined in the *Homestead ARB Caiman Removal Feasibility Study* (AMEC, 2012). The spectacled caiman is an exotic species and directly competes with the protected alligator and crocodile for food and habitat. The alligator and crocodile both also occur on HARB. The *Homestead ARB Caiman Removal Feasibility Study* recommends that HARB conduct periodic surveys and removal efforts of the spectacled caiman to control the population on the base.

Project 2.4.5: Implement initiatives to minimize and control invasive and exotic plants species as well as the competing exotic caimans within the habitats that are required for alligator populations. HARB proposes to increase the suitable habitat for the alligator and crocodile species occurring on the base. Removing exotic species and added native plant species would improve the habitat quality.

Project 2.4.6: Conduct a radio-tracking survey of Crocodilian species (crocodiles, alligators, and caimans) and their movements throughout HARB. Information from the surveys would be used to develop management strategies for the crocodiles and alligators in addition to control and eradication strategies for the exotic caiman.

Project 3.1.1: Develop a working team at HARB to integrate the concepts in the INRMP into existing plans and programs at the installation. The team will consist of a representative from each department that is tasked with the responsibility of implementing the key programs, plans, or policies for integration with INRMP objectives.

Project 3.1.2: Continue the work of the HARB ESOHC in accordance with AFI 90-801, *Environment, Safety & Occupational Health Councils*. Use the ESOHC and the HARB EMS to establish a training program to implement ecosystem management principles in all planning and management processes.

Project 3.1.3: For new projects, determine the need for compliance with Florida Coastal Zone Management Program as required by AFI 32-7064, Chapter 5. Identify what projects proponents must do to demonstrate that proposed activities are consistent to the

extent practicable with the enforceable provision of the Florida Coastal Management Program.

Project 3.2.1: Develop a T&E species training course for HARB personnel and contractors involved in activities on the installation whose jobs may directly or indirectly affect natural resources program success. The course would increase awareness among those who work on HARB and have the potential to impact protected species during their work. The course could be expanded to include educational opportunities for other on-base personnel who are interested in protected species. The goal of the course would be to increase awareness of protected species and their importance in the environment among HARB personnel, which would benefit natural resources management at HARB. The course would consist of a series of presentations and handouts.

Project 3.2.2: Develop an invasive species training course for HARB personnel and contractors involved in activities on the installation whose jobs may directly or indirectly affect natural resources program success. The course would increase awareness among those who work on HARB and have a role that could introduce or facilitate the spread of invasive species during their work. The course could be expanded to include educational opportunities to other on-base personnel who are interested. The overall goal of the course would be to minimize the potential for spread of invasive species through greater awareness, which would benefit natural resource management at HARB. The course would consist of a series of presentations and handouts.

Project 3.2.3: Use pamphlets, flyers, command units, and the internet to disseminate information to installation personnel and visiting commands. Encourage participation of installation personnel by providing information about HARB's natural resources and providing motivation through communication of important contributions and success stories. Initiate an annual environmental awareness achievement award for contributions such as project suggestions, proactive participation, ingenuity, and cost savings.

Project 3.2.4: Identify projects or use public events (e.g., Earth Day) to offer hands-on training and individual participation in activities to better demonstrate the concept, application, and importance of conservation and ecosystem management. These activities would supplement other education and outreach activities conducted by HARB.

Project 3.2.5: Establish a "Living Laboratory" pine rockland for in conjunction with the nearby Air Base Elementary School along SW 288th Street. HARB would restore the remnant pine rockland area and use it as a "living laboratory" for the nearby Air Base Elementary School. The "living laboratory" would be used as a teaching tool to educate local school children about this severely threatened native pine rockland ecosystem, the multiple protected species endemic to this habitat, and to promote an environmental ethic in the students.

Project 3.3.1: Identify programs that may be applicable to HARB, especially in terms of potential partnership initiatives to promote stewardship plans, foster conservation awareness, and provide or receive technical assistance. These programs would complement resource management on HARB.

Project 3.3.2: Monitor changes to and actions completed for ecosystem management initiatives undertaken by the government and non-government entities. Modify HARB's role and participation in programs as necessary.

Project 3.3.3: Evaluate consultation with AFCEE, HQ AFRC, and the Miami-Dade County DERM for development of conservation plans and plant/wildlife studies.

Appendix B
Correspondence

Kent, Sara/ATL

From: Powell, Brian <brian_powell@fws.gov>
Sent: Tuesday, October 28, 2014 3:34 PM
To: Kent, Sara/ATL
Subject: Re: HARB INRMP Status
Attachments: HARB INRMP COMMENTS_HT _AVB_BCP.docx

Sara,
First I must apologize for such a huge delay in getting you our comments!!!! It has been one diversion after another for me. I was actually finishing up my comments as you emailed, so please find them attached. I dont believe they are too major to require significant revisions, just a little more details on some of the things that were proposed. Feel free to call me if you would like to discuss in further detail once you have had a chance to go through them.

Brian Powell
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
South Florida Ecological Service Office
1339 20th Street
Vero Beach, Fl 32960
772-469-4315 - office
772-562-4288 fax

On Tue, Oct 28, 2014 at 2:07 PM, <Sara.Kent@ch2m.com> wrote:

> Hello Brian,
>
> It's been a few weeks since we touched base on the HARB INRMP. Any updates you can provide would be much appreciated. Thanks!
>
> **Sara Kent**
>
> CH2M HILL
>
> 6600 Peachtree Dunwoody Rd.
>
> 400 Embassy Row, Suite 600
> Atlanta, Georgia 30328
>
> 678-530-4513 direct
>
> sara.kent@ch2m.com
>
> **From:** Powell, Brian [mailto:brian_powell@fws.gov]
> **Sent:** Monday, October 06, 2014 9:53 AM

To: Kent, Sara/ATL
Cc: Ashleigh Blackford
Subject: Re: HARB INRMP Status

Hi Sara,

I am traveling out of town today and will be back on Thursday. My comments are sitting with my supervisor for approval now. I hope to be able to send them to you when I get back on Thursday.

Brian Powell

Fish and Wildlife Biologist

U.S. Fish and Wildlife Service

South Florida Ecological Service Office

1339 20th Street

Vero Beach, Fl 32960

772-469-4315 - office

772-562-4288 fax

On Mon, Oct 6, 2014 at 9:49 AM, <Sara.Kent@ch2m.com> wrote:

> Good Morning Brian,
>
> Just checking in on the status of the HARB INRMP. Have you had a chance to finish up your review? When we last talked in mid-September, you were planning to send comments on the INRMP by the end of September or early October. Any updates you can provide would be greatly appreciated. Let us know if you have any questions. Thanks!
>
> **Sara Kent**
>
> CH2M HILL
>
> 6600 Peachtree Dunwoody Rd.

400 Embassy Row, Suite 600
Atlanta, Georgia 30328

678-530-4513 direct

sara.kent@ch2m.com

HARB INRMP COMMENTS

The population of Small's milkpea at HARB is estimated at approximately 400,000 plants. HARB is the largest known occurrence of Small's milkpea, and this site is critically important to the survival and recovery of the species. Significant impacts to the Small's milkpea populations on HARB have the potential to inhibit the survival and recovery of the species. As such we recommend that HARB include conservation actions in the INRMP and in future Section 7 consultations that support recovery of the species. The Service recommends HARB set the goal of no net reduction of the total number of populations of Small's milkpea on the property as well as other federally listed and candidate plant species habitat. Further the Service recommends that HARB budget for a restoration program for listed and candidate plant species with an aim to have no net loss of populations due to HARB operations. Other DOD installations (for example, U.S. Army Garrison Hawaii) that have occurrences of endangered plant species currently use this strategy.

We recommend that the INRMP include language that describes the process that HARB will implement when activities are conducted that will have the potential to effect listed species. For example, if HARB activities will affect any individuals of any listed plant or animal species, HARB is required to consult with the Service under Section 7 of the ESA before the action is implemented. Various HARB operations such as mowing, landscape improvements, facilities construction, etc. could potentially harm federally listed plants and any impacts should be quantified in a timely manner so that appropriate population maintenance or protection measures can be implemented. When an action is planned that will affect any listed plant species, HARB should survey the area that will be impacted prior to the activity, and enter into consultation with the Service. The area should then be re-surveyed shortly after the activity is concluded to determine the loss of individuals. For ongoing activities that affect areas with listed plants, we recommend that HARB and the Service conduct a programmatic consultation to evaluate impacts and conservation measures, and follow-up surveys should be conducted annually. For unaffected areas, the 3-year interval currently proposed in the INRMP is sufficient.

The Service recommends that the INRMP include language that stipulates that areas containing listed or candidate plants will not be converted to turf grasses. In general, exotic grasses should be avoided and areas with listed or candidate plants or habitat that could support them should not be seeded or sodded. Furthermore, we encourage HARB to consider that areas with exotic grasses be controlled or eliminated in areas with listed plants if this can be accomplished without harm to listed species. As an example, IRC (2013) states that in 2013 a population (#22) of Small's milkpea was sodded over with St. Augustine grass. Based on the

size of the affected area and density of nearby populations, this action eliminated 200-300 Small's milkpea plants. This action also threatens other nearby populations if St. Augustine grass moves into these areas.

Additionally, the INRMP discusses maintenance of common/open areas some of which contain populations of Small's milkpea and sand flax. The maintenance includes mowing, which is beneficial for the survival of both species. However, there is no discussion of frequency or duration of mowing activities in areas where the two plant species exists. Please consider specifying that open areas containing populations of Small's milkpea, sand flax, or other listed or candidate plants will be mowed at least twice a year and will also be mowed as long as there are individual plants present. Mowing should be conducted after plants have seeded and at a minimum height of 30 centimeters (11.8 inches) if possible to minimize harm and maximize reproduction.

The measures identified in the INRMP PPMP under 4.4 Seed Collection/Distribution suggest that conservation actions will only occur "if seeds are available prior to disturbing an area with Small's milkpea or sand flax". This seems to suggest that if seeds are not available, no measures will be implemented to restore individuals lost due to disturbance from HARB operations. We recommend that the conservation measure states that if actions that disturb plants are planned in an area with listed or candidate species then…. Effective conservation planning requires that seeds be collected prior to the disturbance occurring and used to restore populations in the area if disturbance is temporary, or in areas that are set aside for the species conservation at HARB if the disturbance is permanent. As part of this measure we recommend that you include two methods for re-establishing plants from seed, if it can be demonstrated that direct sowing of seeds is adequate to establish new individuals, then this method would be acceptable. If not, seeds should be used to propagate plants in a nursery for planting back into areas that will not be disturbed by operations, such as pine rockland restoration areas or other areas that will continue to be managed by mowing.

HARB is within the consultation focus area for the Florida bonneted bat (FBB). The INRMP includes the Florida bonneted bat, acknowledges that the species has been observed elsewhere in the Homestead area in close proximity to HARB, and proposes a survey to determine presence; however, the plan suggests that the potential for the species to occur on-site is unlikely. Due to the species' use of other habitat fragments in Miami-Dade County, we believe that HARB provides important foraging habitat and possibly also roosting habitat. Please consider incorporating the following BMPs in the INRMP as a demonstration of how HARB is

conservering/promoting FBB. Furthermore, we recommend that HARB conduct acoustic surveys in consultation with the Service to improve knowledge on if/how FBB are using the installation and whether they are roosting on the property. Suspected roost sites may be located based on one or more of the following: bonneted bats are observed emerging from a tree cavity, bat vocalizations ("chattering") have been heard from a tree/snag cavity, large bats (>5 inches in length) have been seen flying or bats have been heard vocalizing in the vicinity, the tree/snag exudes an ammonia-like smell, or bat guano has been seen around the base of the tree/snag.

- Conserve open freshwater and wetland habitat to promote foraging opportunities.
- avoid impacting water quality.
- Conserve and/or enhance riparian habitat.
- Avoid or limit widespread application of insecticides • Retain natural vegetation to promote insect diversity, availability, and abundance.
- Enhance roosting opportunities for FBB by retaining trees and snags. These may include live trees of various sizes and dead or dying trees with cavities, hollows, or crevices.
- Once identified, protect known and historic roost trees, regardless of occupation by bats, by establishing a buffer around the roost to ensure that roost sites remain suitable for the Florida bonneted bat. Coordinate buffer size and activities within the buffer with the Service.
- Limit permanent night-time lighting. Avoid and minimize the use of artificial lighting, retain natural light conditions, and promote the use of environmentally friendly lighting practices to minimize impacts to wildlife.
- If potential roost trees need to be removed, check cavities to ensure they are not occupied by bats prior to removal of trees or snags.
- Incorporate engineering designs that discourage bats from using buildings or structures. If Florida bonneted bats take residence within a structure, contact the Service prior to attempting removal or when conducting maintenance activities on the structure.
- Rake and/or clear vegetation around the base of known or suspected roost trees to remove fuel prior to prescribed burning If possible, use ignition techniques such as spot fires or backing fire to limit the intensity of fire around the base of the tree or snag containing the roost. The purpose of this action is to prevent the tree or snag from catching fire with roosting bats inside, and also to attempt to limit the exposure of the roosting bats to heat and smoke.

- When creating firebreaks or conducting fire-related mechanical treatment, mark and avoid any known or suspected bat roosts.

***Threatened and Endangered Species Survey and Management Plan* (e2M, Inc. 2005a)**. Please provide this document for review.

Some of the actions proposed in the INRMP as well as activities associated with base operations have the potential to result in Take of federally listed species. These activities are examples of where a programmatic consulation would be beneficial to ensure that HARB can continue to conduct regular maintenance and ensure compliance with ESA. Independent of the INRMP, the Service recommends that HARB consider initiating formal consultation with the Service to develop a program in which HARB is provided the regulatory protections necessary to remain in compliance with ESA.

Kent, Sara/ATL

From: McDonough, Vanessa <vanessa_mcdonough@nps.gov>
Sent: Tuesday, August 19, 2014 3:42 PM
To: Kent, Sara/ATL
Cc: Tony Pernas; ANDREJKO, MICHAEL J GS-11 USAF AFRC 482 BCE/CEV; Reaves, Richard/ATL; brian.e.peck; crystal.e.taylor; elsa
Subject: Re: HARB INRMP Update - NPS Responses to Comments

I just looked over the matrix, and I have no further comments or concerns.

Thank you

Vanessa McDonough, Ph.D.
Fishery and Wildlife Biologist
Biscayne National Park
9700 SW 328th St
Homestead, FL 33033
ph: 305-230-1144 ext 027
fax: 305-230-1190

On Tue, Aug 19, 2014 at 3:16 PM, <Sara.Kent@ch2m.com> wrote:

> Good Afternoon Tony and Vanessa,
>
> Just wanted to touch base on the email below I sent last month. Have you had a chance to review our responses to your comments on the HARB Draft Final INRMP? Please let me know if you have any questions. If needed, I can set up a quick conference call to further discuss. Once again we appreciate your time and review of the INRMP. Thanks!
>
> **Sara Kent**
>
> CH2M HILL
>
> 6600 Peachtree Dunwoody Rd.
>
> 400 Embassy Row, Suite 600
> Atlanta, Georgia 30328
>
> 678-530-4513 direct
>
> sara.kent@ch2m.com

From: Kent, Sara/ATL
Sent: Friday, July 25, 2014 10:27 AM
To: 'Pernas, Tony'; 'McDonough, Vanessa'; elsa
Cc: 'ANDREJKO, MICHAEL J GS-11 USAF AFRC 482 BCE/CEV'; Reaves, Richard/ATL; Peck, Brian E SAM; Taylor, Crystal E SAM
Subject: HARB INRMP Update - NPS Responses to Comments

Good Morning,

I have attached the comment-response matrix with responses to NPS comments on the HARB INRMP Update. Please review and let me know if you have any questions with our responses.

In response to Tony Pernas' general comment on the project implementation timeline and performance measures, we created the attached “Annual Project

Tracking Sheet” to be included with Appendix A. HARB would complete the sheet annually to track the implementation and progress of the proposed projects.

Please let us know if you have any questions or comments with the attached items. If needed, I can set up a conference call to further discuss. Thanks!

Sara Kent

CH2M HILL

6600 Peachtree Dunwoody Rd.

400 Embassy Row, Suite 600
Atlanta, Georgia 30328

678-530-4513 direct

sara.kent@ch2m.com

Kent, Sara/ATL

From: Alvear, Elsa <elsa_alvear@nps.gov>
Sent: Friday, July 25, 2014 2:41 PM
To: Kent, Sara/ATL
Cc: Tony Pernas; Vanessa McDonough; Michael Andrejko; Reaves, Richard/ATL; Brian.E.Peck@usace.army.mil; Crystal.E.Taylor@usace.army.mil
Subject: Re: HARB INRMP Update - NPS Responses to Comments

Thank you, I have no comments or questions, but the other NPS folks cc'd might.

On Fri, Jul 25, 2014 at 10:26 AM, <Sara.Kent@ch2m.com> wrote:

> Good Morning,
>
> I have attached the comment-response matrix with responses to NPS comments on the HARB INRMP Update. Please review and let me know if you have any questions with our responses.
>
> In response to Tony Pernas' general comment on the project implementation timeline and performance measures, we created the attached “Annual Project
>
> Tracking Sheet” to be included with Appendix A. HARB would complete the sheet annually to track the implementation and progress of the proposed projects.
>
> Please let us know if you have any questions or comments with the attached items. If needed, I can set up a conference call to further discuss. Thanks!
>
> **Sara Kent**
>
> CH2M HILL
>
> 6600 Peachtree Dunwoody Rd.
>
> 400 Embassy Row, Suite 600
> Atlanta, Georgia 30328
>
> 678-530-4513 direct
>
> sara.kent@ch2m.com

--
Elsa M. Alvear, Chief of Resource Management, Biscayne National Park
9700 S.W. 328th Street, Homestead, FL 33033
Direct 786-335-3623 Main 305-230-1144 ext 002 Fax 305-230-1190

Kent, Sara/ATL

From: Towles, Tim <tim.towles@MyFWC.com>
Sent: Thursday, July 10, 2014 5:44 PM
To: Kent, Sara/ATL
Subject: RE: HARB INRMP Update Coordination - Draft Final for Agency Review

Hi Sara,

Yes, we reviewed the draft Final INRMP, but had "no comments" for this stage in the process.

From: Sara.Kent@CH2M.com [mailto:Sara.Kent@CH2M.com]
Sent: Thursday, July 10, 2014 4:00 PM
To: Towles, Tim
Cc: michael.andrejko@us.af.mil; Richard.Reaves@CH2M.com; m.andrejko@aol.com
Subject: RE: HARB INRMP Update Coordination - Draft Final for Agency Review

Good Afternoon Tim,

Hope you are well. Just checking in on your review of the HARB Draft Final INRMP update. Have you had a chance to review the document? Please let me know if you have any comments or questions. We appreciate your review and look forward to your feedback. Thanks!

Sara Kent
CH2M HILL
6600 Peachtree Dunwoody Rd.
400 Embassy Row, Suite 600
Atlanta, Georgia 30328
678-530-4513 direct
sara.kent@ch2m.com

From: Towles, Tim [mailto:tim.towles@MyFWC.com]
Sent: Thursday, May 08, 2014 3:48 PM
To: Kent, Sara/ATL
Subject: RE: HARB INRMP Update Coordination - Draft Final for Agency Review

Sara,

I'm located in Vero Beach. The address is: 1339 20th Street, Vero Beach, FL 32960. The address you have listed below is for our South Regional office.

From: Sara.Kent@CH2M.com [mailto:Sara.Kent@CH2M.com]
Sent: Thursday, May 08, 2014 2:08 PM
To: Towles, Tim
Subject: RE: HARB INRMP Update Coordination - Draft Final for Agency Review

Hi Tim,

Thanks for the response. Please confirm your mailing address below is correct. I will ship the hard copy tomorrow or early next week. I'll send you an email when the hard copy is in transit. Thanks!

8535 Northlake Boulevard
West Palm Beach, FL 33412

Sara Kent
CH2M HILL
6600 Peachtree Dunwoody Rd.
400 Embassy Row, Suite 600
Atlanta, Georgia 30328
678-530-4513 direct
sara.kent@ch2m.com
***Note new address

From: Towles, Tim [mailto:tim.towles@MyFWC.com]
Sent: Thursday, May 08, 2014 2:02 PM
To: Kent, Sara/ATL
Subject: RE: HARB INRMP Update Coordination - Draft Final for Agency Review

Hi Sara,

One hard copy along with an electronic one.

Thanks,
Tim

From: Sara.Kent@CH2M.com [mailto:Sara.Kent@CH2M.com]
Sent: Thursday, May 08, 2014 11:41 AM
To: Towles, Tim
Cc: Richard.Reaves@CH2M.com; michael.andrejko@us.af.mil
Subject: RE: HARB INRMP Update Coordination - Draft Final for Agency Review

Hello Tim,

The Air Force has completed their review of the Homestead Air Reserve Base (HARB) Draft INRMP Update, and we are preparing the Draft Final INRMP for agency review. We will be sending you a courtesy copy of the INRMP for your review. Please let me know if you would prefer electronic or hard copies, and how many hard copies do you request?

Please let us know if you have any questions and always feel free to call me directly. Thanks!

Sara Kent
CH2M HILL
6600 Peachtree Dunwoody Rd.
400 Embassy Row, Suite 600
Atlanta, Georgia 30328
678-530-4513 direct
sara.kent@ch2m.com
***Note new address

From: Kent, Sara/ATL
Sent: Wednesday, October 23, 2013 4:00 PM
To: 'tim.towles@MyFWC.com'
Cc: Reaves, Richard/ATL; 'ANDREJKO, MICHAEL J GS-11 USAF AFRC 482 BCE/CEV'
Subject: HARB INRMP Update Coordination

Hello Tim,

CH2M HILL is assisting Mike Andrejko with updating the Homestead Air Reserve Base (HARB) Integrated Natural Resources Management Plan. We are preparing the Draft INRMP Update, and we want to include your agency early in

the process to ensure we identify relevant issues and get input as early as possible. As you are likely aware, HARB has little usable land beyond the airfield and cantonment area. Airfield operations and associated security requirements prevent use of HARB for recreational hunting or fishing. Therefore, these activities are not reflected in the INRMP.

The following is a list of upcoming projects that will likely be included the INRMP update:

- Butterfly Study
- Migratory Bird Study
- Herpetology Study
- Intensive Study of Military Canal Flora and Fauna Study
- Threatened and Endangered Species Training Course
- Landscaping Plan
- Quantitative Fish Study
- Wildfire Management Plan
- "Living Laboratory" in remnant Pine Rockland for local charter school along 288th
- Investigate restoration of degraded area around the old grenade range as Pine Rockland habitat. Further, once restored, evaluate the potential use of this area as a mitigation site for impacts to Small's milkpea in other parts of the installation.
- Update HARB GIS files to include locations of occurrences of exotic species (plants and animals)

Please let us know if you have any questions or input on the list and/or if FFWCC has any other issues that should be considered.

I am the CH2M HILL project manager, and Rich Reaves (copied on this email) is the senior technical consultant for the INRMP Update project. I believe you spoke with Rich a couple months ago when we kicked-off the project. We will be working with Mike and helping him with agency coordination through the INRMP process.

Could you please provide a phone number where we could reach you, as it may be easier to discuss this rather than try and sort out through email? Thanks for your assistance.

Sara Kent
Environmental Scientist
CH2M HILL
1000 Abernathy Road, Suite 1600
Atlanta, Georgia 30328
678-530-4513 direct
sara.kent@ch2m.com

Kent, Sara/ATL

From: Pernas, Tony <tony_pernas@nps.gov>
Sent: Friday, July 18, 2014 3:49 PM
To: Kent, Sara/ATL
Subject: Re: HARB INRMP Update Coordination - Draft Final for Agency Review

Follow Up Flag: Follow up
Flag Status: Completed

Hi Sara,

Sorry for the slow response. A few comments:

In general the plan seems to be adequate in identifying basic resource management needs for HARB as well as estimated costs. The plan though appears to be lacking in a strategic focus that clearly states the specific actions that HARB will undertake. The plan should include a detailed timeline for the specific natural resource actions including specifics on monitoring, data analysis and the sharing of information (publication goals etc.). The plan should also include a budget strategy (How are all these needs going to be prioritized and funded?) as well as performance measures to assure that resource goals are being adequately met.

A few specifics:

Chapter 2 2.1

Line 7 The plan states the HARB will integrate natural resource and land management action with other agencies and points to Appendix A. This might be a good place to introduce and describe examples of HARB's management actions and how they might directly relate to other agencies.

Chapter 5 5.3

Coyotes are common in the South Dade, HARB area. These should be mentioned along with the possible impacts on native animals such as burrowing owls. They are mentioned much later in the plan but are absent in this section.

5.5/5.5.1 Why two separate sections?

5.5.1 Should have an introductory paragraph explaining the imacts of invasive animals to the natural environment, similar to 5.5.2.

Thanks

Tony Pernas
Coordinator
National Park Service
Florida/Caribbean EPMT
18001 Old Cutler Road, Suite 419
Palmetto Bay, Florida 33157
(786)249-0073

On Thu, Jul 10, 2014 at 4:07 PM, <Sara.Kent@ch2m.com> wrote:

> Good Afternoon Tony,
>
> Hope you are well. Just checking in on your review of the HARB Draft Final INRMP. Have you had a chance to review the document? Please let me know if you have any comments or questions. We appreciate your review and look forward to your feedback. Thanks!
>
> **Sara Kent**
>
> CH2M HILL
>
> 6600 Peachtree Dunwoody Rd.
>
> 400 Embassy Row, Suite 600
> Atlanta, Georgia 30328
>
> 678-530-4513 direct
>
> sara.kent@ch2m.com
>
> ---
>
> **From:** Kent, Sara/ATL
> **Sent:** Tuesday, May 13, 2014 2:36 PM
> **To:** 'Pernas, Tony'
> **Cc:** Reaves, Richard/ATL; 'Michael Andrejko'
> **Subject:** RE: HARB INRMP Update Coordination - Draft Final for Agency Review
>
> Hi Tony,
>
> As discussed on the phone, I have shipped 1 hard copy and CD of the HARB Draft Final INRMP. You should receive the package tomorrow morning.

We appreciate your review of the INRMP, and please feel free to contact me if you have any questions or if you need anything else. Thanks!

Sara Kent

CH2M HILL

6600 Peachtree Dunwoody Rd.

400 Embassy Row, Suite 600
Atlanta, Georgia 30328

678-530-4513 direct

sara.kent@ch2m.com

***Note new address

From: Kent, Sara/ATL
Sent: Thursday, May 08, 2014 11:50 AM
To: 'Pernas, Tony'
Cc: Reaves, Richard/ATL; Michael Andrejko
Subject: RE: HARB INRMP Update Coordination - Draft Final for Agency Review

Hello Tony,

The Air Force has completed their review of the Homestead Air Reserve Base (HARB) Draft INRMP Update, and we are preparing the Draft Final INRMP for agency review. We will be sending you a courtesy copy of the INRMP for your review. Please let me know if you would prefer electronic or hard copies, and how many hard copies do you request?

Please let us know if you have any questions and always feel free to call me directly. Thanks!

Sara Kent

CH2M HILL

6600 Peachtree Dunwoody Rd.

400 Embassy Row, Suite 600
Atlanta, Georgia 30328

678-530-4513 direct

sara.kent@ch2m.com

***Note new address

From: Pernas, Tony [mailto:tony_pernas@nps.gov]
Sent: Monday, November 18, 2013 10:19 AM
To: Kent, Sara/ATL
Subject: Re: HARB INRMP Update Coordination

Hi Sara,

The Golden Beard grass monitoring/treatment is ongoing. We will continue to partner with USDA/Wildlife Services on invasive reptile issues such as the nile monitor lizard.

Much of our involvement is the though the Everglades Cooperative Invasive Species Management Area (ECISMA) www.evergladescisma.org.

The current ECISMA MOU will expire in December. HARB should sign the next MOU?

My contact info is below.

thanks

Tony Pernas

Coordinator

National Park Service

Florida/Caribbean EPMT

18001 Old Cutler Road, Suite 419

Palmetto Bay, Florida 33157

(786)249-0073

On Fri, Nov 1, 2013 at 2:16 PM, <Sara.Kent@ch2m.com> wrote:

Hi Tony,

I just left you a voicemail on your office phone. I apologize for the delay in returning your call from last week.

I appreciate the information you provided in your email and voicemail. However, I had couple follow-up questions:

1) Is the golden beard grass and Nile monitor lizard invasive species management with HARB ongoing? Or was the management conducted over a designated time period?

2) Do you have any other potential projects HARB should consider including in the INRMP update? We have added a few proposed projects, which I have included in the updated list below.

Proposed projects for the INRMP update:

- Landscape Management Plan
- Quantitative Fish Study
- Wildfire Management Plan
- Invasive Species Management Plan
- Butterfly study
- Migratory Bird study
- Herpetology study
- Intensive Study of Military Canal Flora and Fauna Study
- Threatened and Endangered Species training course

- Invasive species training course

- "Living Laboratory" Pine Rockland for charter school along 288th

Please let me know if you have any questions. I am also in the office all next week if you would like to discuss further. Thanks!

Sara Kent

Environmental Scientist

CH2M HILL
1000 Abernathy Road, Suite 1600

Atlanta, Georgia 30328

678-530-4513 direct

sara.kent@ch2m.com

From: Pernas, Tony [mailto:tony_pernas@nps.gov]
Sent: Thursday, October 17, 2013 10:44 AM
To: Kent, Sara/ATL
Subject: Re: HARB INRMP Update Coordination

Hi Sara,

Sorry for the delay in responding, we have assisted HARB in invasive species management efforts with Golden Beard Grass and Nile Monitor lizards.

Hope this helps?

Tony Pernas

Coordinator

National Park Service

Florida/Caribbean EPMT

18001 Old Cutler Road, Suite 419

Palmetto Bay, Florida 33157

(786)249-0073

On Fri, Sep 20, 2013 at 3:28 PM, <Sara.Kent@ch2m.com> wrote:

Hello Tony,

CH2M HILL is assisting Mike Andrejko with updating the HARB Integrated Natural Resources Management Plan. Mike has indicated to us that HARB and the NPS Florida/Caribbean Exotic Plant Management Team have worked together on some natural resource issues in the past, and he has requested that we coordinate with you regarding natural resource issues of mutual interest. We have just begun the INRMP Update, and we want to include your agency early in the process to ensure we identify relevant issues and get input as early as possible.

Can you please provide a brief description of any past activities and involvement Florida/Caribbean Exotic Plant Management Team has cooperated with HARB on as we would like to capture this information in the INRMP Update?

The following is a list of upcoming projects that will likely be included the INRMP update related to exotic species control at HARB:

- Intensive Study of Military Canal Flora and Fauna Study
- Landscaping Plan
- Quantitative Fish Study
- Wildfire Management Plan
- "Living Laboratory" Pine Rockland for local charter school along 288th

- Investigate restoration of degraded area around the old grenade range as Pine Rockland habitat that may be usable as mitigation for impacts to Small's milkpea in other parts of the installation.

- Update HARB GIS files to include locations of occurrences of exotic species (plants and animals)

Please let us know if you have any questions or input on the list and/or if the NPS Florida/Caribbean Exotic Plant Management Team has any other issues that should be considered.

I am the CH2M HILL project manager, and Rich Reaves (copied on this email) is the senior technical consultant for the INRMP Update project. We will be working with Mike and helping him with agency coordination through the INRMP process.

Could you please provide a phone number where we could reach you, as it may be easier to discuss this rather than try and sort out through email. Thanks for your assistance.

Sara Kent

Environmental Scientist

CH2M HILL
1000 Abernathy Road, Suite 1600

Atlanta, Georgia 30328

678-530-4513 direct

sara.kent@ch2m.com

Kent, Sara/ATL

From: McDonough, Vanessa <vanessa_mcdonough@nps.gov>
Sent: Friday, July 11, 2014 2:19 PM
To: Kent, Sara/ATL
Subject: Re: FW: *Please Read* CH2M HILL Virus Scan has DELETED a Message
Attachments: Draft Final HARB_INRMP_12May2014_reduced2_VM comments_shortened.pdf

trying again...

Vanessa McDonough, Ph.D.
Fishery and Wildlife Biologist
Biscayne National Park
9700 SW 328th St
Homestead, FL 33033
ph: 305-230-1144 ext 027
fax: 305-230-1190

On Fri, Jul 11, 2014 at 2:14 PM, <Sara.Kent@ch2m.com> wrote:

> Hi Vanessa,
>
> Looks like you were trying to send me your comments on the HARB Draft Final INRMP. Unfortunately, we cannot accept files over 10MB. Maybe you can split up the PDF and resend it? Sorry for the inconvenience. Thanks.
>
> Sara Kent
> CH2M HILL
> 6600 Peachtree Dunwoody Rd.
> 400 Embassy Row, Suite 600
> Atlanta, Georgia 30328
> 678-530-4513 direct
> sara.kent@ch2m.com
>
> -----Original Message-----
> From: CH2MHILL Email System Messages [mailto:emailsystemmessages@smtp6.ch2m.com]
> Sent: Friday, July 11, 2014 2:11 PM
> To: Kent, Sara/ATL; elsa; Reaves, Richard/ATL; ANDREJKO, MICHAEL J GS-11 USAF AFRC 482 BCE/CEV; m.andrejko
> Subject: *Please Read* CH2M HILL Virus Scan has DELETED a Message
>
> Be advised that the following message was not accepted because it exceeded CH2M HILL's default message size limit of 10MB.
>
> A 'very limited' number of recipients have been given a higher message size limit due to the typical size of project deliverables. If you've been given an exemption and still received this notice, most likely the message intended for you exceeded the exempted message size (see total message size below).
>
> Please note, the sender has also been advised, but for security reasons the message size limit is not included in

the notice to senders.

To:sara.kent <Sara.Kent@ch2m.com>

From:"McDonough, Vanessa" <vanessa_mcdonough@nps.gov>

Subject:Re: HARB INRMP Update Coordination - Draft Final for Agency Review

Date/Time:07/11/14/12:11:16

Total Message Size (in bytes):16655144

Attachment Name(s):Draft Final HARB_INRMP_12May2014_reduced2_VM comments.pdf

Attachment Size(s):12134473

Note: The message size at time of receipt, due to SMTP processing overhead, may be larger than the original message size at the time of transmission. Total message size includes all attachments.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

MARJORY STONEMAN DOUGLAS BUILDING
3900 COMMONWEALTH BOULEVARD
TALLAHASSEE, FLORIDA 32399-3000

RICK SCOTT
GOVERNOR

CARLOS LOPEZ-CANTERA
LT. GOVERNOR

HERSCHEL T. VINYARD JR.
SECRETARY

July 11, 2014

Ms. Sara Kent
CH2M Hill
6600 Peachtree Dunwoody Road
400 Embassy Row, Suite 600
Atlanta, GA 30328-6773

RE: Department of the Air Force – Draft Final Integrated Natural Resources Management Plan Update for Homestead Air Reserve Base – Homestead, Miami-Dade County, Florida.
SAI # FL201405136894C

Dear Ms. Kent:

The Florida State Clearinghouse has coordinated a review of the referenced Draft Final Integrated Natural Resources Management Plan (INRMP) under the following authorities: Presidential Executive Order 12372; § 403.061(42), *Florida Statutes*; the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended; and the National Environmental Policy Act, 42 U.S.C. §§ 4321-4347, as amended.

Based on the information contained in the Draft Final INRMP and the enclosed state agency comments, the state has determined that, at this stage, the proposed activities are consistent with the Florida Coastal Management Program (FCMP). The state's continued concurrence will be based on the activities' compliance with FCMP authorities, including federal and state monitoring of the activities to ensure their continued conformance, and the adequate resolution of any issues identified during subsequent regulatory reviews. The state's final concurrence of the projects' consistency with the FCMP will be determined during the environmental permitting process, in accordance with Section 373.428, *Florida Statutes*, if applicable.

Thank you for the opportunity to review the draft document. If you have any questions regarding this letter, please contact Mr. Chris Stahl at Chris.Stahl@dep.state.fl.us or (850) 245-2169.

Yours sincerely,

Lauren P. Milligan

Lauren P. Milligan, Coordinator
Florida State Clearinghouse
Office of Intergovernmental Programs

Enclosures

Project Information	
Project:	FL201405136894C
Comments Due:	06/23/2014
Letter Due:	07/12/2014
Description:	DEPARTMENT OF THE AIR FORCE - DRAFT FINAL INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN UPDATE FOR HOMESTEAD AIR RESERVE BASE - HOMESTEAD, MIAMI-DADE COUNTY, FLORIDA.
Keywords:	USAF - DRAFT FINAL INRMP FOR HOMESTEAD AIR RESERVE BASE - MIAMI-DADE CO.
CFDA #:	12.200

Agency Comments:
TRANSPORTATION - FLORIDA DEPARTMENT OF TRANSPORTATION
The FDOT Aviation Office and District Six staff have no comments.
ENVIRONMENTAL PROTECTION - FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
No Comments
STATE - FLORIDA DEPARTMENT OF STATE
No Comment/Consistent
SOUTH FLORIDA WMD - SOUTH FLORIDA WATER MANAGEMENT DISTRICT
No Comments
FISH and WILDLIFE COMMISSION - FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
No Comments
SOUTH FL RPC - SOUTH FLORIDA REGIONAL PLANNING COUNCIL
No Comments Received
MIAMI-DADE -

For more information or to submit comments, please contact the Clearinghouse Office at:

3900 COMMONWEALTH BOULEVARD, M.S. 47
TALLAHASSEE, FLORIDA 32399-3000
TELEPHONE: (850) 245-2161
FAX: (850) 245-2190

Visit the Clearinghouse Home Page to query other projects.

RECEIVED

JUL 07 2014

DEP Office of intergovt'I Program!'

COUNTY: MIAMI-DADE

DATE: 5/13/2014
COMMENTS DUE DATE: 6/23/2014
CLEARANCE DUE DATE: 7/12/2014
SAi#: FL201405136894C

MESSAGE:

STATE AGENCIES	WATER MNGMNT. DISTRICTS	OPB POLICY UNIT	RPCS & LOC GOVS
ENVIRONMENTAL PROTECTION	SOUTH FLORIDA WMD		
FISH and WILDLIFE COMMISSION			
X STATE			
TRANSPORTATION			

The auachcd document requires a Coastal Zone Management Act/Florida Coastal Management Program consistency evaluation and is catcgorizcd as one of lhc following:

_ Fcden1l Assistance to State or Loca l Government {ISCFR 930, Sub11art F). Agencies are 1·ec111ii•cd to evaluate the consistency of the activity.

Oir·ect Federal Activity (IS CFR 930, Sub11art C). Federal Agencies arc required to furnish a consistency determination for the State's coucurrcu cc or objection.

_ Outer Continental Shelf Ex11loration, Ocvclopmcnt or Production Activities (IS CFR 930, Subput E). Operators are required to provide a consistency ccrtificntion for state concurrence/objection.

_ Federal Licensing or Permitting Activity (IS CFR 930, Sub1rn1·t D). Su ch projects will only be evaluated for consistency when there is not an analogous Stale licCIISC or JICI'mit.

Project Description:

DEPARTMENT OF THE AIR FORCE - DRAFT FINAL INTEGRATED NATURA L RESOURCES MANAG EMENT PLAN UPDATE FOR HOMESTEAD A IR RESERVE BASE - HOMESTEAD, MIAMI-DADE COUNTY , FLORIDA.

To: Florida State Clearinghouse

AGENCY CONTACT AN D COORDINATOR (SCH)
3900 COMMON WEALTH BOULEVARD MS-47
TA LLAHASSEE, FLORIDA 32399-3000
TELEPHONE: (850) 245-2161
FAX: (850) 245-2190

EO. 12372/NEPA Federal Consistency

- No Comment
- Comment Attached
- Not Applicable
- v'No Comment/Consistent
- Consistent/Comments Attached
- Inconsistent/Comments Attached
- Not Applicable

From:

Division/Bureau: ti,) br·{,-A/ R"""""n--e-> / 1./skct'c. h'.&:f,b

Reviewer: -;C (?,,,,_)

Date: 6/30/ltj

Kent, Sara/ATL

From: Alvear, Elsa [elsa_alvear@nps.gov]
Sent: Friday, September 20, 2013 3:58 PM
To: Kent, Sara/ATL
Cc: Vanessa McDonough; Reaves, Richard/ATL; Michael Andrejko
Subject: Re: HARB INRMP Update Coordination

Hello:

HARB and NPS/BNP have indeed collaborated on many projects, including but not limited to exotic plant control, exotic animal control, crocodilian surveys, canal fish surveys, and a big project in the past was the Homestead Joint Land Use Survey and AICUZ (Air Installation Compatible Use Zone). You probably also want to involve Tony Pernas from our Exotic Plant Management regional office. He can be reached at 305-252-0347 or tony_pernas@nps.gov. Vanessa, did I forget anything?

I can be reached at 786-335-3623 (direct line).

On Fri, Sep 20, 2013 at 3:26 PM, <Sara.Kent@ch2m.com> wrote:

Hello Elsa and Vanessa,

CH2M HILL is assisting Mike Andrejko with updating the HARB Integrated Natural Resources Management Plan. Mike has indicated to us that HARB and NPS have worked together on some natural resource issues in the past, and he has requested that we coordinate with you regarding natural resource issues of mutual interest. We have just begun the INRMP Update, and we want to include your agency early in the process to ensure we identify relevant issues and get input as early as possible.

The following is a list of upcoming projects that will likely be included the INRMP update:

- Butterfly Study
- Migratory Bird Study
- Herpetology Study
- Intensive Study of Military Canal Flora and Fauna Study
- Threatened and Endangered Species Training Course
- Landscaping Plan
- Quantitative Fish Study

- Wildfire Management Plan

- "Living Laboratory" Pine Rockland for local charter school along 288th

- Investigate restoration of degraded area around the old grenade range as Pine Rockland habitat that may be usable as mitigation for impacts to Small's milkpea in other parts of the installation.

- Update HARB GIS files to include locations of occurrences of exotic species (plants and animals)

Please let us know if you have any questions or input on the list and/or if Biscayne Bay NP has any other issues that should be considered.

Also, can you please provide a brief description of any past activities and involvement Biscayne Bay NP has cooperated with HARB on? You need not describe exotic species control efforts. Mike asked that we contact Tony Pernas directly about that issue.

I am the CH2M HILL project manager, and Rich Reaves (copied on this email) is the senior technical consultant for the INRMP Update project. We will be working with Mike and helping him with agency coordination through the INRMP process.

Could you please provide a phone number where we could reach you, as it may be easier to discuss this rather than try and sort out through email. Thanks for your assistance.

Sara Kent

Environmental Scientist

CH2M HILL
1000 Abernathy Road, Suite 1600

Atlanta, Georgia 30328

678-530-4513 direct

sara.kent@ch2m.com

--
Elsa M. Alvear, Chief of Resource Management, Biscayne National Park
9700 S.W. 328th Street, Homestead, FL 33033
Direct 786-335-3623 Main 305-230-1144 ext 002 Fax 305-230-1190

Kent, Sara/ATL

From: Pernas, Tony [tony_pernas@nps.gov]
Sent: Thursday, October 17, 2013 10:44 AM
To: Kent, Sara/ATL
Subject: Re: HARB INRMP Update Coordination

Hi Sara,

Sorry for the delay in responding, we have assisted HARB in invasive species management efforts with Golden Beard Grass and Nile Monitor lizards.

Hope this helps?

Tony Pernas
Coordinator
National Park Service
Florida/Caribbean EPMT
18001 Old Cutler Road, Suite 419
Palmetto Bay, Florida 33157
(786)249-0073

On Fri, Sep 20, 2013 at 3:28 PM, <Sara.Kent@ch2m.com> wrote:

Hello Tony,

CH2M HILL is assisting Mike Andrejko with updating the HARB Integrated Natural Resources Management Plan. Mike has indicated to us that HARB and the NPS Florida/Caribbean Exotic Plant Management Team have worked together on some natural resource issues in the past, and he has requested that we coordinate with you regarding natural resource issues of mutual interest. We have just begun the INRMP Update, and we want to include your agency early in the process to ensure we identify relevant issues and get input as early as possible.

Can you please provide a brief description of any past activities and involvement Florida/Caribbean Exotic Plant Management Team has cooperated with HARB on as we would like to capture this information in the INRMP Update?

The following is a list of upcoming projects that will likely be included the INRMP update related to exotic species control at HARB:

- Intensive Study of Military Canal Flora and Fauna Study

- Landscaping Plan

- Quantitative Fish Study

- Wildfire Management Plan

- "Living Laboratory" Pine Rockland for local charter school along 288th

- Investigate restoration of degraded area around the old grenade range as Pine Rockland habitat that may be usable as mitigation for impacts to Small's milkpea in other parts of the installation.

- Update HARB GIS files to include locations of occurrences of exotic species (plants and animals)

Please let us know if you have any questions or input on the list and/or if the NPS Florida/Caribbean Exotic Plant Management Team has any other issues that should be considered.

I am the CH2M HILL project manager, and Rich Reaves (copied on this email) is the senior technical consultant for the INRMP Update project. We will be working with Mike and helping him with agency coordination through the INRMP process.

Could you please provide a phone number where we could reach you, as it may be easier to discuss this rather than try and sort out through email. Thanks for your assistance.

Sara Kent

Environmental Scientist

CH2M HILL
1000 Abernathy Road, Suite 1600

Atlanta, Georgia 30328

678-530-4513 direct

sara.kent@ch2m.com

Kent, Sara/ATL

From: Hobgood, Winston [winston_hobgood@fws.gov]
Sent: Wednesday, October 23, 2013 5:25 PM
To: Kent, Sara/ATL
Cc: Reaves, Richard/ATL; michael.andrejko@us.af.mil; Barry Wood
Subject: Re: HARB INRMP Update Coordination

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Sara,

Thanks, Sara. Sounds good to me. I'd like to call your attention to two pine rockland plants and two butterflies that were just listed.

The proposed rules to list *Brickellia mosieri* (Florida brickell bush) and *Linum carteri* var.*carteri* (Carter's small-flowered flax) as endangered and designate critical habitat were published in the Federal Register on October 3. These pine rockland plants occur exclusively in Miami-Dade County outside ENP. Brickellia is typically found in fairly intact pine rocklands while Linum may be found in previously disturbed/cleared pine rockland areas. We might be able to reestablish these plants in the preserved areas?

Two butterflies that inhabit pine rockland in Miami-Dade County were also proposed for listing in August.

Anaea troglodyta floridalis. Florida leafwing butterfly. Invert FL (S. FL) Martin (H), Palm Beach (H), Broward (H), Miami-Dade, Monroe (H), Collier (H)

Strymon acis bartrami, Bartram's hairstreak butterfly. Invert FL Palm Beach (H), Broward (H), Collier (H), Miami-Dade, Monroe

These species also have proposed critical habitat. Our GIS guru will be sending you shapefiles for these species.

Looking forward to your call next week.

Sincerely,

Winston Hobgood
U.S. Fish and Wildlife Service
1339 20th Street
Vero Beach, Florida 32960

(772) 469-4306

On Wed, Oct 23, 2013 at 3:55 PM, <Sara.Kent@ch2m.com> wrote:

Hello Winston,

CH2M HILL is assisting Mike Andrejko with updating the Homestead Air Reserve Base (HARB) Integrated Natural Resources Management Plan. I believe Rich Reaves contacted you a couple months ago to initiate coordination for the INRMP Update process. We have begun preparing the Draft INRMP update, and we want to ensure we identify relevant issues for your agency and get input as early as possible.

The following is a list of upcoming projects that will likely be included the INRMP update:

- Butterfly Study
- Migratory Bird Study
- Herpetology Study
- Intensive Study of Military Canal Flora and Fauna
- Threatened and Endangered Species Training Course
- Landscaping Plan
- Quantitative Fish Study
- Wildfire Management Plan
- "Living Laboratory" in remnant Pine Rockland for local charter school along 288th
- Investigate restoration of degraded area around the old grenade range as Pine Rockland habitat. Further, once restored, evaluate the potential use of this area as a mitigation site for impacts to Small's milkpea in other parts of the installation.
- Update HARB GIS files to include locations of occurrences of exotic species (plants and animals)

Please let us know if you have any questions or input on the list and/or if USFWS has any other issues that should be considered.

I am the CH2M HILL project manager, and Rich Reaves (copied on this email) is the senior technical consultant for the INRMP Update project. We will be working with Mike and helping him with agency coordination through the INRMP process.

Please feel free to call me directly if you would like to discuss further. I will also plan to touch base with you next week as a follow-up to this email. Thanks.

Sara Kent

Environmental Scientist

CH2M HILL
1000 Abernathy Road, Suite 1600

Atlanta, Georgia 30328

678-530-4513 direct

sara.kent@ch2m.com

Appendix C
BASH Plan

BY ORDER OF THE COMMANDER
482D FIGHTER WING

482D FIGHTER WING INSTRUCTION
91-212

20 JUNE 2011

Safety

BIRD/WILDLIFE AIRCRAFT STRIKE HAZARD (BASH) REDUCTION PROGRAM

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

ACCESSIBILITY: Publications and forms are available on the e-Publishing website at **www.e-publishing.af.mil** for downloading or ordering.

RELEASABILITY: There are no releasability restrictions on this publication.

OPR: 482 FW/SE

Certified by: 482 FW/SE
(Lt Colonel Joseph Feheley)

Pages: 24

This instruction implements and expands guidance in Air Force Policy Directive (AFDP) 91-2, *Safety Program*, , AFI 91-202, *The United States Air Force (USAF) Mishap Prevention Program*, and Air Force Pamphlet (AFPAM) 21-212, *Bird Wildlife Aircraft Strike Hazard (BASH) Management Program*, dated 1 February 2004. This instruction provides a base program designed to minimize aircraft exposure to potentially hazardous bird/wildlife strikes and control bird populations which could jeopardize aircraft at Homestead Air Reserve Base (HARB). Tasked organizations will develop checklists, etc. as required to fulfill assigned responsibilities. This instruction will be reviewed annually and require on-site reviews every 36 months, as appropriate, by tasked organizations. . Refer recommended changes to and questions about this publication to the Office of Primary Responsibility (OPR) using Air Force (AF) Form 847, *Recommendation for Change of Publication;* route AF Form 847 from the field through the appropriate functional's chain of command. Ensure all records created as a result of processes prescribed in this publication are maintained in accordance with (IAW) Air Force Manual (AFMAN) 33-363, *Management of Records*, and disposed of IAW the Air Force Records Disposition Schedule (RDS) located at **https://www.my.af.mil/gcss-af61a/afrims/afrims/rims.cfm**.

Chapter 1

CONDITIONS FOR EXECUTION

1.1. Conditions for Execution: This Instruction is based on hazards from both resident and seasonal bird populations. Implementation of specific portions of the Instruction is continuous, while other portions will be implemented as required due to bird activity and weather conditions.

1.2. OPERATIONS TO BE CONDUCTED:

1.2.1. Specific Operations Include:

1.2.1.1. Procedures for reporting hazardous bird activity, alerting pilots, notifying key agencies, dispersing birds through non-lethal and/or lethal means, and if necessary, limiting or discontinuing flying operations.

1.2.1.2. Provisions to disseminate information to all assigned and transient pilots for specific bird hazards, and procedures to minimize exposure.

1.2.1.3. Procedures to eliminate or reduce environmental conditions that attract birds to the airfield and Miami-Dade County Landfill (M-DCLF).

1.2.1.4. Procedures to disperse birds on the airfield and the M-DCLF.

1.2.1.5. The sustainment of a Bird Hazard Working Group (BHWG).

1.3. Tasked Organizations: As listed in Chapter 2.

1.4. Supporting Plans: None required.

1.5. Key Assumption: Bird activity poses a significant threat to aircraft flight operations.

1.6. Time to Commerce Operation: Prior to and during normal flight operations including aircraft deployment and contingency operations. Specific operations commence whenever Bird Watch Condition (BWC) MODERATE OR SEVERE is declared.

Chapter 2

GENERAL

2.1. Basic Instructions: A bird/wildlife aircraft strike hazard exists at HARB and its vicinity due to resident and migratory bird species and other wildlife. Daily and seasonal bird movements create various hazardous conditions. This Instruction establishes procedures to minimize bird strikes at HARB and local flying areas. No single solution exists to the BASH risk. The risk must be managed from every angle. A variety of techniques and organizations are involved in administering the program and managing the risk. Specifically, this Instruction is designed to:

2.1.1. Establish procedures to identify and avoid high risk situations, and to aid supervisors and pilots in altering/discontinuing flying operations when required.

2.1.2. Help disseminate information to all assigned and transient pilots on bird hazards and procedures for bird avoidance.

2.1.3. Establish guidelines to decrease airfield attractiveness to birds.

2.1.4. Provide procedures for dispersing birds when they occur on the airfield or at the Miami-Dade County Land Fill (M-DCLF).

2.1.5. Sustain a Bird Hazard Working Group (BHWG) and designate responsibilities to its members.

2.1.6. Compile seasonal/yearly data to track bird concentration patterns and help make educated decisions regarding the flying schedule.

2.2. Airfield and Local Area. Homestead Air Reserve Base is located on 1943 acres in southeast Miami-Dade County, Florida, approximately three miles from the Biscayne Bay Seashore and wholly within the confines of the South Miami-Dade Wildlife Conservation area. The average elevation of this area is six feet above sea level. Several features of the surrounding area are conducive to bird habitation. The Base is bordered by large tracts of farmland. There is a large Miami-Dade County landfill located approximately five miles north of the base. Birds are attracted to landfills just as they are to any source of food. Homestead Air Reserve Base is drained by several man-made canals and drainage ditches. These canals and drainage ditches provide an excellent environment for water birds.

2.3. Area surrounding the runway complex. The area surrounding the runway complex consists of a mix of Florida grasses which is carefully maintained by a civilian contractor. The infield area between the taxiways and runway remains attractive to wildlife in search of food, shelter, and water. Some parts are designated as wetlands and maintained only periodically.

2.4. Low level routes. 482d Fighter Wing (482 FW) aircraft are restricted from using the local overland low-level flying routes and areas. The 482 FW weighed the training benefits of low level flying against the risk to its pilots and aircraft and decided to discontinue low level operations. This decision to terminate low-level flying can be rescinded any time mission requirements change. References to low level activities will remain in this publication for possible future use. When low level procedures were in effect HARB aircraft used southern Florida as the primary low-level flying area. This area has many features which attract a variety

of birds from migratory waterfowl and unnamed species, to shore birds and indigenous soaring birds. The two most hazardous species are migratory waterfowl and raptors (hawks, black vultures, turkey vultures). Specific hazards are outlined in Chapter 4.

2.5. Avon Park Air Force Range. Avon Park occupies 106,110 acres of land in Polk and Highlands counties in central Florida. Most of the area is typically southern Florida Flatwoods comprised of nearly level sandy flatlands with small swamps and wet grasslands. The terrain in and around Avon Park provides an abundant variety of habitats for birds that are hazardous to aircraft. Specifics are outlined in Chapter 4.

2.6. Execution:

2.6.1. Reducing the bird strike hazard at HARB requires a cooperative effort between several base organizations. The OPR for coordinating this Instruction is 482 FW/ Safety Office (482 FW/SE).

2.6.2. Bird Hazard Working Group (BHWG):

2.6.2.1. Function. Collects, compiles, and reviews data on bird strikes; identifies and recommends actions to reduce hazards. Recommends changes in operational procedures. Prepares informational programs for pilots. Assists the operations group commander by acting as a point of contact for off-base BASH issues.

2.6.2.2. Authority. The BHWG submits all recommendations to the operational commander for approval. Implementation is through normal chain of command.

2.6.2.3. Composition. The chairperson is the Vice Wing Commander. As a minimum, the group will consist of a representative from Flight Safety, Aircraft Maintenance, Civil Engineering, Airfield Management, tenant units, and representatives from other tasked organizations (Chapter 2) as required.

2.6.2.4. Meeting Schedule. The BHWG will meet quarterly as part of the Combined Environmental Safety and Occupational Health (ESOH) Council during Phase I (April through October) normal bird activity. HARB has designated the months of November through March as Phase II. Phase II normally indicates periods of increased bird activity due to seasonal migrations. Historically, migratory activities that HARB experiences are not consistent from one year to another. During one given year the base might experience migratory birds and then not again for several more years. With this information in mind, during Phase II months the 482 FW/SE office will meet weekly with the biologists assigned to the base and discuss any ongoing trends. Additionally, the Wing Safety office will run the Phase II Migratory Bird Hazard ORM Checklist. If there is unusual bird activity or trending the Wing Safety office will convene a meeting of the BHWG to recommend implementing Phase II procedures. If no increased activity exists the BHWG will stay on a quarterly meeting schedule. The USDA Biologists will publish a monthly report throughout the year to document all activities and trends.

Chapter 3

TASK ORGANIZATIONS

3.1. 482FW/CV.

3.2. 482FW/OG.

3.3. 93FS/CC.

3.4. 482FW/SE.

3.5. 482 OG/OGV.

3.6. 482FW/SEF.

3.7. 482MSG/BCE/CE.

3.8. 482OSF/OSA/OSAA.

3.9. 482OG/SOF.

3.10. 482FW Biologist.

3.11. 482OSF/OSAT.

3.12. Tenants Det 1, 125FW/CC and Miami Air and Marine Branch/CC.

3.13. Avon Park Range.

3.14. Tasks and Responsibilities:

3.14.1. Vice Wing Commander

3.14.1.1. Chairs BHWG meetings

3.14.1.2. Approves recommendations of BHWG

3.14.2. Operations Group Commander

3.14.2.1. Oversees the Supervisor of Flying (SOF) Program which in turn declares, disseminates, and terminates bird watch conditions at HARB and the local training areas.

3.14.2.2. Issues specific procedural guidance for pilots and the SOF for each bird watch condition.

3.14.2.3. Authority for granting or denying permission for any flying activity that is outside the normally approved procedures for a particular Bird Watch Condition.

3.14.2.4. Issues implementation procedures and actions required by the Command Post in support of this Instruction.

3.14.2.5. Makes operational changes to avoid areas and times of known hazardous bird concentrations, mission permitting. Considers the following during periods of increased bird activity:

3.14.2.5.1. Raising pattern altitude.

3.14.2.5.2. Changing pattern direction.

3.14.2.5.3. Avoiding takeoffs/landings within 1 hour of dawn/dusk.

3.14.2.5.4. Limiting or prohibiting formation takeoffs and landing.

3.14.2.5.5. Utilizing trail departures with rejoin altitudes greater than 3000 feet AGL.

3.14.2.5.6. Rescheduling local training to different areas.

3.14.2.5.7. Raising altitude en route to low-level or training areas.

3.14.2.5.8. Limiting time on low-level routes to the minimum training requirements.

3.14.2.5.9. Selecting low-level routes or training areas based on bird hazard data from the US Fish and Wildlife Service or the computerized Bird Avoidance Model (BAM).

3.14.2.5.10. Splitting formations during recovery.

3.14.2.5.11. Making full-stop landings.

3.15. 93d Fighter Squadron Commander:

3.15.1. Ensures pilots participate in the BASH reduction program by adhering to the directives contained in this Instruction. Ensures that pilots promptly report all bird strikes (Form 853), and hazardous BASH conditions IAW this directive.

3.16. Not Used.

3.17. Chief, Safety, 482 FW.

3.17.1. Monitors base-wide compliance with BASH Program and ensures all bird-aircraft strikes and hazards are reported in the Air Force Safety Automated System (AFSAS) database per AFI 91-202, AFP 91-212, and Chapter 6 of this Instruction.

3.17.2. Reports on BASH issues and includes BHWG recommendations and actions in the agenda and minutes of the wing's quarterly ESOH Council meeting.

3.17.3. Plans and conducts the BHWG for the Chairperson. Disseminates BASH data to the BHWG.

3.17.4. Provides the BHWG with the current BASH guidance from HHQ, the BASH team, the contracted BASH service, and other outside agencies. Additionally, presents Bird Hazard Condition trend data collected from the ATC tower and the BASH contractor biologist. This data is used by the BHWG to evaluate or modify operational procedures.

3.17.5. Supports and administers the BASH contract.

3.17.6. Briefs pilots monthly on bird strikes affecting unit aircraft.

3.18. Chief, Wing Standardization/Evaluation:

3.18.1. Reviews, with Operations Group Commander, all proposed new low-level routes and training areas or changes to existing routes/areas for BASH potential.

3.18.2. Monitors flight briefings and debriefs to ensure bird strike avoidance is discussed when appropriate, and that Avon Park bird avoidance procedures are adhered to.

3.19. Flying Safety Officer:

3.19.1. Ensures pilots promptly report all bird strikes and hazardous conditions per this directive.

3.19.2. In the absence of the Base Biologist, logs all bird strikes affecting HARB aircraft in the AFSAS database.

3.19.3. Ensure that the current bird activity data is available and briefed for each applicable planned phase of flight, and educates pilots on the use of the Bird Avoidance Model (BAM) and Avian Hazard Advisory System (AHAS) computer programs.

3.19.4. Ensure adequate supplies of BASH report forms (Form 853) are readily available for pilots. The blank forms are in the FCIF volume V (Flight Safety) located at the 93d Fighter Squadron (93 FS) Operations Desk, or at maintenance debrief.

3.19.5. Briefs pilots on seasonal bird hazards, specifically during Phase II periods, contingencies and after-dark operations. Movies, articles, cross tells and other information will be used as appropriate to maintain awareness.

3.20. Base Civil Engineer:

3.20.1. Provides natural resources representation to the BHWG to monitor and advise the group of relevant environmental factors.

3.20.2. Develops procedures for removal or control of bird attractants.

3.20.3. Initiates surveys and writes environmental impact assessments and statements as required.

3.20.4. Corrects environmental conditions that increase BASH potential.

3.20.5. Uses land management practices that reduce BASH potential.

3.20.6. Modifies airfield habitat consistent with runway lateral and approach zone management criteria. Accomplishes habitat reduction to reduce the bird risk beyond the 1000 feet distance criterion.

3.20.7. Managing Grass Height. Maintains a uniform grass height between 7 and 14 inches. Determine mowing frequency as needed to maintain height requirements. Coordinate mowing with periods of low flight activity. Cut grass before it goes to seed to discourage seed-eating birds from utilizing the airfield. Proper grass height discourages flocking species from entering the airfield because reduced visibility disrupts inter-flock communication and flock integrity and also prevents predator detection. As a rule, do not permit grass to exceed 14 inches as high grass will attract some bird species and rodents which, in turn, attract raptors (birds of prey).

3.20.8. Airfields with a variety of grass species may have a fast-growing strain which reaches 14 inches sooner than the rest of the airfield. Mow when the average grass height exceeds 14 inches. Mowing should start at the runway edge or as close as possible. Mow parallel to the runway and work toward the infield to avoid scaring birds towards the runway. Obtain assistance in herbicide selection for weed control, appropriate grass seed selection, fertilization, and erosion control vegetation from the US Soil Conservation Service or the Agricultural Extension Service.

3.20.9. Controlling broad-leaf weeds. Keep broad-leaf weeds to a minimum on the airfield. Apply herbicides, as necessary, to achieve this. Broad-leaf weeds attract a variety of birds, may produce seeds or berries, and may limit grass growth.

3.21. Chief, Airfield Management:

3.21.1. The authority to declare bird watch conditions is vested with the SOF during normal flight operations. During all other periods, the Chief of Airfield Management, or their designated representative, is the declaring authority.

3.21.2. The Chief of Airfield Management bases the declaration of a bird watch condition on:

3.21.2.1. Observations made by the base or BASH contractor.

3.21.2.2. Information relayed by airborne aircraft or other HARB personnel, familiar with the BASH program, working on the airfield.

3.21.2.3. Observations made and relayed to base operations by HARB tower, End of Runway crews, and Transient Alert personnel.

3.21.3. The Chief of Airfield Management should appoint a bird scare team. This team is activated at times when birds on the airfield create hazardous conditions, but as a minimum when Bird Watch Condition "Severe" is declared. The bird scare team will, as a minimum, have immediate access to bioacoustics and pyrotechnic equipment for bird dispersal. This equipment must be stored in an approved location where access is readily available.

3.22. Supervisor of Flying (SOF):

3.22.1. Authority to declare bird watch conditions is vested with the SOF during normal flight operations. The SOF considers inputs from agencies below, but the Bird Hazard Condition declaration, responsibility, and authority rests with the SOF. The SOF bases the declaration of a bird watch condition on:

3.22.1.1. Observations made by the base or BASH contractor.

3.22.1.2. Information relayed by airborne aircraft.

3.22.1.3. Observations made, and relayed to base operations by HARB tower, End of Runway crews, and Transient Alert personnel.

3.22.2. Implements flying procedures in response to elevations in the Bird Watch Condition. Informs the OG commander and the Chief of Airfield Management of Bird Severe declaration and includes the status of any airborne HARB aircraft.

3.22.3. Fills out the End of Tour Spot Inspection Report located on the computer at the SOF station in the tower. The changes in BWC are data based to help in tracking efforts.

3.23. Contracted BASH service providerwill:

3.23.1. Monitor the airfield during all 482 FW day flying periods and minimize the bird hazard using techniques defined in this publication. Additionally, during times of the year when birds are active at night (migratory swallows) birdman will cover all night flying periods.

3.23.2. Will request assistance from the bird scare team through the Chief of Airfield Management when conditions are beyond the birdman's ability to control the bird hazard.

3.23.3. Request access to the airfield from the Chief of ATC or their representative in the tower via the Ground Control frequency and inform the tower when vacating the airfield environment.

3.23.4. Maintains a current bird activity map for HARB.

3.23.5. Briefs pertinent information gained from conducting his job to the BHWG and the quarterly EOSH Council. Additionally, he should provide any additional information on migratory, local, and seasonal bird activities through contact Audubon Society, local ornithologists, and other agencies.

3.23.6. Compiles daily BWC data to help plan the flying activities at HARB.

3.23.7. Implements many various techniques for decreasing the bird threat to HARB aircraft.

3.23.7.1. Bioacoustics. Bioacoustics is taped distress or alarm calls of actual birds. The equipment required to adequately project these calls includes a cassette tape deck mounted in a vehicle and a speaker mounted on its roof. Special care must be taken to play the tape in short intervals to prevent habituation by the birds. Play the tape for 20-30 seconds and then pause briefly. Repeat the procedure several times if necessary. The birds should respond by taking flight or becoming alert. These calls are effective for gulls, blackbirds, starlings, cowbirds, grackles, ravens, crows, and some shorebirds. Pyrotechnics should be used in conjunction with bioacoustics to enhance complete dispersal.

3.23.7.2. Pyrotechnics. Pyrotechnics are 12- gauge (or similar) scare cartridges that produce a secondary explosion to scare the birds from the area. The scare cartridges are launched from either a shotgun or a pyrotechnic pistol. Pyrotechnics are effective for dispersing most bird species.

3.23.7.3. Propane Cannons. Propane cannons may also be used. These devices should be operated, especially at dawn and dusk, as birds come in to feed or roost. Cannons must be relocated frequently to avoid habituation problems. These devices are very effective on waterfowl, pheasants, and other game birds and can also be used for gulls and blackbirds.

3.23.7.4. Depredation. Birds must be killed occasionally as a reinforcement of other methods. Domestic pigeons, European starlings, and house sparrows can be killed without a permit. Most other species require federal and state permits. When Airfield Management is involved in any depredation action they shall coordinate through the contractor for permits and direction in this area.

3.23.7.5. Other Devices. Ingenuity is encouraged in the bird scare program. Other devices may be used. Radio-controlled model aircraft, hawk kites, model birds in distressed positions, falconry, etc., may all be considered based on availability and problem bird species. Contact the BASH team at HQAFSC/SEFW, 9700 Ave, G. SE, Bldg 24499, Kirtland AFB, NM 87117-5670, for advice in this area.

3.23.8. Ineffective Methods. Ultrasound, rubber snakes, stuffed owls, rotating/ flashing lights, loud music, and other such devices have not proven effective and should not be used.

3.23.9. Conducts daily airfield and M-DCLF surveys. Dead birds should be removed and routed through the Wing Safety office for identification by the Smithsonian Institute.

3.23.10. Tracks and collects daily and seasonal data on BASH low, moderate, and severe conditions for BASH prevention purposes. The data can be obtained from the Chief of ATC or their representative in the tower, and from the Supervisor of Flying (End of Tour spot inspection forms). This data will help the 482 FW identify hazardous trends and modify the flying program if required.

3.23.11. Tracks bird numbers to establish seasonal migration levels that affect the BASH program.

3.23.12. Works with the Flying Safety Officer logging all bird strikes in the Air Force, AFSAS database.

3.23.13. Coordinates with pilots and maintenance personnel for collecting of non-fleshy remains after strikes. Sends any salvaged bird strike remains to the Smithsonian Institution at the address below for identification.

Figure 3.1. Smithsonian Institution Natural History Bldg.

Smithsonian Institution, Natural History Bldg.
Division of Birds, ATTN: Carla Dove
P.O. Box 37012, E610, MRC 116
10th and Constitution Ave NW
Washington, D.C. 20013-7012
(202) 357-2334

3.23.13.1. Provide 482 FW/SE office with a monthly written report on the bird activities and trends for HARB.

3.24. Chief, Air Traffic Control:

3.24.1. Chief of ATC or their designated representative in the tower reports observed bird activity and recommended bird watch condition to the SOF or Airfield Management/Bash contractor as appropriate. During periods when HARB aircraft are not flying ATC has the authority to raise the BWC status, but not lower it without Airfield Management concurrence.

3.24.2. Issues bird watch advisories to pilots as required.

3.24.3. Provides Contractor/Airfield Management prompt access to the runway under bird watch condition MODERATE or SEVERE.

3.25. Tenant Units:

3.25.1. Det 1, 125 FW and Miami Air and Marine Branch will provide a representative to the BHWG and support the base BASH program as appropriate. Responsibilities during various BWCs are outlined in Chapter 6.

3.26. Avon Park Range (R2901):

3.26.1. Avon Park Range uses the AFPAM 91-212 terminology for making bird watch condition calls on the range area. If other than low, expect the Range Control Officer (RCO) to advise the flight of the current bird condition. For example, “Mako 1, bird condition moderate at Avon Aux, or bird condition moderate in the South extension as reported by Shark 1, 15 minutes ago”. The RCO has the overriding authority to declare BWCs for the auxiliary (AUX) Field and Bombing Ranges due to his proximity to the sites.

Chapter 4

WILDLIFE

4.1. Wildlife. This chapter provides a summary of the bird strike hazards and recommendations for reducing each hazard to flight operations. A brief description of birds commonly involved in collisions with aircraft, and how each method of control or avoidance is to be employed is provided. Each control measure will have a corresponding tasked organization in the basic Instruction.

4.2. Specific Hazards for HARB:

4.2.1. Loons, Grebes, Pelicans, Cormorants, Mergansers. These are fish-eating birds. Control is best accomplished by removing fish-producing ponds near the airfield. Removal of the food source is not always possible, and pyrotechnics can be used to effectively frighten the birds from the area. Avoid flying at sunrise and sunset when large flocks, often in formation, can be found flying to and from feeding areas.

4.2.2. Long-legged Waders (Herons, Egrets, Ibises, Storks). Most of these species are attracted to water where they feed on fish, amphibians, reptiles, and arthropods. Control is best accomplished by eliminating the food sources. Steepening the sides of ditches and ponds and removing emergent vegetation will drastically reduce accessibility to food sources. Use pyrotechnics to disperse any birds that remain after habitat modification.

4.2.3. Cattle Egrets. These birds have different feeding habits than their relatives, preferring open fields where they primarily feed on insects. They frequently follow mowers for the insects which are stirred up. When possible mow during non-flying hours when Cattle Egrets are present. Maintain grass height between 7 to 14 inches. Additionally, periodic pesticide application may be necessary for insect control. Eliminate roost sites on or near the base by removing or thinning roost trees and brush, and dispersing the birds each evening with pyrotechnics.

4.2.4. Migrating waterfowl. Migrating waterfowl are particularly dangerous to flight safety due to the large numbers, size, and generally higher altitude of the birds. Large flocks of waterfowl travel along traditional flyways to their breeding and wintering grounds during spring and fall. The flocks may stop along the route awaiting favorable weather conditions to continue. Migrating birds are most active from sunset through midnight, with numbers decreasing in the early morning hours. October and November are the most hazardous months. Avoid flying during the evening hours if possible. Obtain Bird Avoidance Model (BAM) data from the BASH website for information and planning purposes for comparing low level routes. Wintering concentration areas should be avoided.

4.2.5. Raptors (Hawks, Falcons, Kites, Eagles, Vultures). These birds can be particularly hazardous to aircraft because of their size and widespread distribution over bases and low level areas. Raptors (particularly vultures) use thermals to their advantage to search for prey. These birds become active during mid-morning and remain aloft until late afternoon. Avoid areas with thermal generating terrain such as ridge lines, rolling hills, and near water. Landfills are particularly attractive to soaring vultures. Our neighborhood landfill is only 2.1 NM north of the approach end of Runway 23. Utilization of a second Base Contractor may significantly reduce the threat that the landfill poses to the airfield environment. In the fall,

raptors migrate by day to areas of heavy winter concentrations in the southern states and throughout Central America. These birds can be controlled by removing dead animals on the airfield, proper management of landfills, rodent control on airfields, and removal of dead trees and other perching sites on the airfield. Use pyrotechnics to frighten raptors from the airfield.

4.2.6. Cranes. These large birds are most hazardous during migrating periods, particularly in the fall when many thousands of birds may be concentrated in a small area. Avoid flying at dawn and dusk in areas of known concentration. Use pyrotechnics on the airfield to disperse these birds.

4.2.7. Sandpipers/Shorebirds. The most significant hazard from these birds occurs when large numbers flock in tight groups, particularly during migration and along coastlines. Many of the upland species such as upland sandpipers and buff-breasted sandpipers may nest on airfields in spring and early summer. Other species such as killdeer are quite adept at avoiding aircraft and do not pose a significant hazard. Flocks in coastal areas can be hazardous and should be avoided. To control these birds, observe proper grass height management. Eliminate water in puddles and steepen ditch banks to limit access to these birds. Use pyrotechnics for all species, and some respond well to bioacoustics.

4.2.8. Gulls. These birds represent the most significant hazard to aircraft worldwide. Due to their omnivorous feeding habits and preference for flat, open areas to rest, they are commonly found on airfields. Gulls are most active just after sunrise and before sunset as they move to and from feeding areas. Improperly operated landfills are a significant source of attraction for gulls and should not be allowed in the airfield vicinity. Maintain grass height between 7 and 14 inches. This is critical in reducing gull numbers. Even with this in effect, gulls may inhabit the airfield, particularly during inclement weather. Persistent harassment using pyrotechnics and bioacoustics is necessary to discourage these birds. Occasionally, use live ammunition to reinforce these techniques. Consider other techniques such as gas cannons, model gulls, radio-controlled model aircraft, and even falconry if available and cost effective. Poisoning of earthworms and insects (especially grasshoppers) may be accomplished if these invertebrates are found to attract gulls. Do not allow these birds to establish a habit of using the airfield to feed, breed, or rest.

4.2.9. Terns. These are fish-eating, gull-like birds common in coastal areas and on some major river systems and lakes. Avoid flying near areas where these birds may be active, such as nesting colonies or piers in coastal areas. Remove the food source or eliminate the fish containing ponds if these birds pose a significant hazard.

4.2.10. Pigeons and Doves. These birds are seed-eaters and are attracted to seed-producing weeds, grasses, and shrubs. Open areas or bare spots are attractive as resting or feeding sites. Pyrotechnics can be effective in frightening these birds. Proper grass-height management, irrigation, and mowing before grass goes to seed will limit the number of pigeons and doves on the field. Pigeons frequently occur in structures such as hangars. Netting, shooting, trapping, poisons baiting, and especially toxic bird perches (such as Rid-A-Bird) can drastically reduce their numbers in these structures.

4.2.11. Owls. Most owls are nocturnal and attracted to rodents as a food source. Rodent control may be necessary on the airfield; proper management of airfield grass will limit their

numbers. Remove perch sites such as unnecessary fence posts and dead trees to limit the number of owls. Avoid over flying landfills at night to reduce hazards from owls.

4.2.12. Goatsuckers (Nighthawks, Whippoorwills, etc.). These birds are active, particularly at sunset when insects are abundant. Little can be done to limit their numbers other than insect control. Avoid flying at times when these birds are abundant, particularly near lakes, streams, or other areas with large insect populations.

4.2.13. .Flycatchers. These birds are present on airfields to feed on insects. Strikes are infrequent, but should not be overlooked. Control is best accomplished by controlling insects and removing perch sites such as fence posts, tree limbs, and bushes.

4.2.14. Crows and Ravens. These omnivorous birds are common in open areas and around landfills. These birds may occur in large flocks, particularly at sunset as they return to roost sites. Proper grass -height management will reduce population numbers. Remove any known roost sites or thin individual roost trees. Operate landfills in a manner to discourage these birds. Use bioacoustics and pyrotechnics to frighten these birds if they occur on the field.

4.2.15. Blackbirds, Grackles, Cowbirds, and Starlings. These birds can be particularly hazardous because they frequently occur in huge flocks, sometimes in the millions. Blackbirds and starlings are attracted to flat, open areas to feed, rest, or stage/pre-roost. Maintain grass height between 7 and 14 inches to best reduce airfield blackbird and starling numbers. Do not allow seed producing plants to grow on the airfield or out lease grain crops in areas where these birds are known to occur. Eliminate roost sites near the flight line. Selectively prune or remove roost trees, brush, or cattails if blackbirds and starlings are roosting on base. Blackbirds and starlings respond well to an intense frightening program using bioacoustics and pyrotechnics. Use other methods to supplement this program as necessary. Starlings are not federally protected and may be killed without permits. Permits are required for other species. Occasional shooting of birds will reinforce other frightening techniques. Consider poisoning or trapping, with US Fish and Wildlife Service assistance. If these birds occur in hangars, use toxic bird perches to eliminate the problem. Avoid at all costs flying near known blackbird and starling roosts, especially at sunrise and sunset and during spring and fall migration. Huge roosting colonies may also be present during winter months in southern states.

4.3. Other Wildlife. While concern is mostly centered on birds, several mammalian and reptile species also pose threats to flight operations and must be considered. Close coordination with the Wildlife Management is necessary to reduce this type of hazard.

4.3.1. Rodents. These animals attract raptors. Control by maintaining a uniform turf at proper heights. Rodenticides may be used in some cases.

4.3.2. Alligators/Caiman. Large alligators and Caiman are often reported on the airfield. They usually occur after heavy rains. The 482 FW will work with Pesky Miami-Dade contractor licensed to deal with large reptiles. No other HARB agency should attempt any type of handling.

4.3.3. Turtles. Occasionally, large soft- shell turtles are reported on the airfield. If they are on the taxiways/runway, remove them and place them a good distance from the hard surfaces.

Chapter 5

REPORTS AND FORMS

5.1. Reports and Forms. This Chapter outlines the procedures and forms required to report bird strikes IAW AFP 91-212 and AFI 91-204 to enhance the BASH program at HARB.

5.1.1. All bird strikes (damaging and non-damaging) are sent to the USAF BASH Team. Report damaging and non-damaging strikes to installation-owned aircraft as they occur on AF Form 853, *Air Force Bird Strike Report*. The AF Forms 853 will be logged into the AFSAS system by the Flight Safety Officer or the BASH contractor. **https://sas.kirtland.af.mil/.** Obtain additional information on bird hazard reduction from AFPAM 91-212, *Bird Aircraft Strike Hazard (BASH) Management Techniques*, and BASH management responsibilities in AFI 91-202 for additional information on BASH requirements.

5.2. Installation flight safety officers. Installation flight safety officers must report all strikes to installation-owned Air Force aircraft regardless of the geographic location of the strikes. For strikes occurring at airfields other than HARB, the 482 FW Flight Safety Officer will log the original report in the AFSAS database and send a copy to the flight safety office of the installation at which the strike occurred (including non-Air Force airfields).

5.3. Bird Remains Identification: Mail any salvaged bird strike non-fleshy remains to:

Figure 5.1. Smithsonian Institution Natural History Building.

Smithsonian Institution, Natural History Building
Division of Birds: ATTN: Carla Dove
P.O. Box 37012, E610, MRC 116
10th and Constitution Ave NW
Washington, D.C. 20013-7012
(202) 357-2334

Chapter 6

OPERATIONAL PROCEDURES

6.1. Pilot Actions: The 482 FW has Operationally Risk Assessed its flying procedures and modified flying operations to reflect current worldwide mission requirements and decrease pilot and aircraft exposure to the majority of the threat. These actions should greatly decrease the potential for a Bird strike mishap. The following pilot actions will be followed by 482 FW pilots under BWCs SEVERE, MODERATE or LOW:

6.1.1. SEVERE: No takeoffs or landings will be permitted for 482 FW aircraft into an airport that is under BWC SEVERE, unless the 482 OG/CC or his designated representative grants approval for operational reasons. 482 FW aircraft already airborne and operating over Air to Ground ranges will remain above 3000 feet Above Ground Level (AGL) to include diving delivery recoveries. 482 FW aircraft that declare an in flight emergency can operate as necessary to safely land the aircraft.

6.1.2. MODERATE: Takeoffs are permitted for 482 FW aircraft. On recovery only a single approach or overhead to a full stop landing is allowed. No pattern work is allowed without approval from the 482 OG/CC or his designated representative. During Air to Ground training plan bomb release altitudes above 3000' AGL for all bomb deliveries with momentary deviations below 3000' AGL allowed during recovery from the dive only. The **exception** to this is when accomplishing RAP tasking events and updating currencies while working on Bravo and Charlie ranges under the control of the Avon Park RCO. Familiarization (FAM) events, Mission Qualification Training (MQT) and Initial Qualification Training (IQT) must be risk assessed and approved by the 482 FW/OG.

6.1.3. LOW: All normal operations are allowed for 482 FW aircraft. Plan all deliveries above 3000' AGL **except** when operating on Avon Park Range in Bravo and Charlie range patterns. On those ranges the aircraft may descend to Low Altitude Event minimums during bombing and strafe passes while working with the Avon Park RCO. For clarification, aircraft working on the Northern or Southern Tactical Ranges, and all other parts of the range must remain above 3000' AGL, (except for dive recovery) even when under control of a ground forward air controller such as a visiting JTAC, TACP, or an ALO.

6.1.4. Communications: Disseminate bird watch conditions by the following means. During periods of flight operations at HARB, or in low-level routes/training areas, etc, include bird watch conditions other than LOW in the ATIS information. Upon receipt of a bird watch condition other than LOW the tower controllers notify base operations of the new status and base operations notifies the command post. The Command Post will notify Wing Safety, and the 93FS. Base operations also ensure bird watch information is posted at the flight data counter for Transient Aircrews.

6.2. Low Level Routes: Low levels are no longer flown locally by 482 FW aircraft, except for incentive flights flown on IR 53 (over the water). The following information will be followed by visiting aircraft or if wing policy changes and the need to fly low levels arise. If the US Bird Avoidance Model Program (BAM) located at **www.usahas.com/bam**/ is reporting MODERATE or above, low levels routes will not be flown. Additionally, low level routes will

normally not be scheduled during the October-March time frame. In either case, the 482 FW OG/CC can waive this for MODERATE depending on mission requirements.

6.2.1. BWC SEVERE. High bird population on/above or in the vicinity of the active runway or intended areas of flight that represents a high potential for strike. Supervisors and aircrews must thoroughly evaluate mission needs before conducting operations in areas under condition SEVERE.

6.2.2. BWC MODERATE. Bird activity in locations, which poses an increased potential for strike. This condition requires higher vigilance by all agencies and supervisors, and caution by aircrews.

6.2.3. BWC LOW. Normal bird activity in the area of flight with a low probability of hazard.

6.3. Declaring Authority:

6.3.1. During HARB flying periods: Authority to declare bird watch conditions is vested with the SOF during normal flight operations. The SOF considers inputs from all sources listed below, but the Bird Hazard Condition declaration, responsibility, and authority rests with the SOF.

6.3.2. During periods of 482 FW non-flying operations: The Chief of Airfield Management or their designee is the declaring authority. The normal designee is the base biologist. See section 3.8 and 3.9.

6.3.2.1. The authority will declare conditions based on ground observations, pilot reports, radar observations, the US Bird Avoidance Model (BAM) internet site located at **www.usahas.com/bam**/ or inputs from other HARB personnel with knowledge of the BASH program.

6.3.2.2. Recommendations should be made to tower personnel over UHF, VHF, or FM radio nets or through the telephone.

6.3.3. Avon Park Range (R2901): The RCO has the overriding authority to declare BWCs for the AUX Field, Charlie and Foxtrot ranges due to his proximity to the sites.

6.3.4. Low Levels: **Low levels are no longer flown locally by 482 FW aircraft, except for incentive flights flown on IR 53 (over the water). The following information will be followed if wing policy changes and the need to fly low levels arise.** If Avon Park Range is calling the range MODERATE or SEVERE, low levels will not be flown. Additionally, low levels will normally not be scheduled during the October-March time frame. In either case, the 482 Opertions Group (OG)can waive this for MODERATE depending on mission requirements.

6.4. Over water Air to Air Airspace: Normally birds do not affect the over water airspace. The areas used by the 482 FW are a significant distance away from land and any birds in the area are low flying types. Pilots are allowed to descend to their event minimums in these areas. If the flight lead assesses the area to be bird moderate or higher for an unusual circumstance the flight will use 3000’ AGL as a minimum for operations.

6.5. Pilot Responsibilities and Procedures: If a pilot observes or encounters any bird activity while in flight, which could constitute a hazard, the pilot should contact the Supervisor of Flying

(SOF), Control Tower, or Range Operations and request that the observed bird activity is passed to the SOF or Base Operations, as appropriate. The following information is necessary:

6.5.1. K - Call -sign

6.5.2. K - Location/Altitude

6.5.3. K - Time of sighting

6.5.4. K - Type of bird (if known)

6.5.5. K - Approximate number of birds

6.5.6. K - Behavior of birds (soaring, flying to or from a location etc.)

6.6. Pilot Actions: The 482 FW has Operationally Risk Assessed its flying procedures and modified flying operations to reflect current worldwide mission requirements and decrease pilot and aircraft exposure to the majority of the threat. These actions should greatly decrease the potential for a Bird strike mishap. The following pilot actions will be followed by 482 FW pilots under BWCs SEVERE, MODERATE or LOW:

6.6.1. SEVERE: Remain above 3000 feet AGL to include dive delivery recoveries.

6.6.2. MODERATE: Plan bomb release altitudes above 3000' AGL for all bomb deliveries with deviations below 3000' AGL during recovery from the dive only. The only **exception** to this is when accomplishing RAP tasking events and updating currencies while working on Bravo and Charlie ranges under the control of the Avon Park RCO. FAM events, MQT and IQT must be risk assessed and approved by the 482 FW/OG.

6.6.3. LOW: Plan all deliveries above 3000' AGL **except** when operating in Bravo and Charlie range patterns. On those ranges the aircraft may descend to Low Altitude Event minimums during bombing and strafe passes while working with the Avon Park Range Control Officer (RCO). For clarification, aircraft working on the Northern or Southern Tactical Ranges, and all other parts of the range must remain above 3000' AGL, (except for dive recovery) even when under control of a ground forward air controller such as a visiting Enlisted Terminal Attack Controller (ETAC), Tactical Air Control Party (TACP), or an Air Liaison Officer (ALO).

6.6.4. Communications: Disseminate bird watch conditions by the following means. During periods of flight operations at HARB, or in low-level routes/training areas, etc, include bird watch conditions other than LOW in the ATIS information. Upon receipt of a bird watch condition other than LOW the tower controllers notify base operations of the new status and base operations notifies the command post. The Command Post will notify Wing Safety, and the 93 FS. Base operations also ensure bird watch information is posted at the flight data counter for Transient Aircrews.

6.7. Low Level Routes: Low levels are no longer flown locally by 482 FW aircraft, except for incentive flights flown on IR 53 (over the water). The following information will be followed by visiting aircraft or if wing policy changes and the need to fly low levels arise. If Avon Park Range is reporting the range MODERATE or above, low levels routes will not be flown. Additionally, low level routes will normally not be scheduled during the October-March time frame. In either case, the 482 FW OG/CC can waive this for MODERATE depending on mission requirements.

6.8. 482 FW Off-Station BWC Procedures. 482 FW Off-Station BWC Procedures for Transit of Civilian/Military Airfields That Do Not.

6.8.1. Report Bird Watch Conditions: The following procedures will be followed by 482 FW pilots while in transit to, or operating at off-station airports (Civ or Mil) that do not report BWCs. Pilots will aggressively seek to obtain the expected bird activity at destination airport or enroute airports. Specifically, during mission planning, reference the Notice to Airman (NOTAMS), Instrument Flight Rules (IFR) Supplement and FLIP AP1, for information on bird activity/BASH procedures (and/or contact the destination airport by phone). Additionally, the US Bird Avoidance Model Program (BAM) is located at **www.usahas.com/bam**/. The BAM program allows the user to get bird activity trend data for the intended area of flight. Airborne monitor the intended destinations ATIS, and contact the airport's base operations and/or Air Traffic Control for bird advisories.

6.9. Detachment 1, 125 FW BWC Procedures:

6.9.1. BWC SEVERE: Cancel local flying unless mission essential. Detachment Commander or 125th Operations Group/Commander (125 OG/CC) approval is required to fly. Airborne aircraft will hold until BWC condition improves or fuel condition requires recovery via a single ship, full stop landing. The Alert force will be placed on "mandatory scramble" status. Note: Mandatory scramble status requires Southeast Air Defense Sector Director of Operations (DO) approval to personally approve scramble. Aircrew risk assessment re-evaluation is required.

6.9.2. BWC MODERATE: Restrict operations to single ship takeoff and recovery. No low approaches or formation takeoffs permitted. Avoid bird concentrations during departure and recovery. Aircrew risk assessment re-evaluation is required.

6.10. Department of Homeland Security Customs and Border Protection. Department of Homeland Security Customs and Border Protection, Miami Air and Marine Branch BWC Procedures:

6.10.1. BWC SEVERE: Only mission essential flights will be conducted. Operations during MODERATE or SEVERE will be conducted only with the specific authorization of the Air and Marine Branch Duty Officer. Aircrew risk assessment re-evaluation is required.

6.10.2. BWC MODERATE: Normal departures and recoveries will be conducted. Local flying will be restricted unless specifically authorized by the Command Duty Officer. Aircrew risk assessment re-evaluation is required.

6.10.3. Receipt of BWC is advisory in nature only through the ATIS message. Flight operations will be conducted at the discretion of the USCS IAW USCS Aviation Operations handbook and applicable Federal Aviation Administration (FAA) Regulations.

6.11. Civilian Aviation BWC Procedures: Civilian traffic utilizing HARB will be governed by FAA Regulations. BWCs will be advisory in nature to Civilian traffic. The pilot in command of the aircraft is directly responsible for and is the final authority for the operations of their aircraft.

DONALD R. LINDBERG, Colonel, USAFR
Commander, 482d Fighter Wing

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

AFPD 91-2, *Safety Program,* 28 September 1993

AFI 33-332, *Privacy Act Program,* 29 January 2004

AFI 91-202, *The USAF Mishap Prevention Program,* 1 August 1998

AFI 91-204, *Safety Investigations and Reports* 14 February 2006

AFP 91-212, *Bird/Wildlife Aircraft Strike Hazard (BASH) Management Techniques,* 1 February 2004

Adopted Forms

AF Form 847, *Recommendation for Change of Publication*

Abbreviations and Acronyms

AF—Air Force

AFI—Air Force Instruction

AFMAN—Air Force Manual

AFP—Air Force Pamphlet

AFPD—Air Force Policy Directive

AFRIMS—Air Force Records Information Management System

AFSAS—Air Force Safety Automated System

AHAS—Avian Hazard Advisory System **AGL**—

Above Ground Level

ALO—Air Liaison Officer

AUX—Auxiliary **ATC**—

Air Traffic Control

AUX—Auxiliary

BAM—Bird Avoidance Model **BASH**—

Bird/Wildlife Aircraft Strike Hazard

BHWG—Bird Hazard Working Group

BWC—Bird Watch Condition **DO**—

Director of Operations

ESOH—Environmental Safety and Occupational Health

ETAC—Enlisted Terminal Attack Controller

FAA—Federal Aviation Administration
FAM—Familiarization **FCIF**—
Flight Crew Information File **FS**—
Fighter Squadron
FW—Fighter Wing **HARB**—
Homestead Air Reserve Base **IQT**—
Initial Qualification Training **IAW**—
In Accordance With **IFR**—Instrument
Flight Rules
M-DCLF—Miami Dade County Landfill
MQT—Mission Qualification Training
NOTAMS—Notice to Airmen **OG**—
Operations Group
OPR—Office of Primary Responsibility
ORM—Operational Resource Management
RCO—Range Control Officer **RDS**—
Records Disposition Schedule **SOF**—
Supervisor of Flying **TACP**—Tactical Air
Control Party **USAFR**—United States Air
Force Reserve **USDA**—U.S. Department of
Agriculture

Appendix D
Integrated Pest Management Plan

Integrated Pest Management Plan
2013

482 Fighter Wing
Homestead Air Reserve Base, Florida

November 2013

APPROVAL AND TECHNICAL REVIEW

Installation Pest Management Coordinator
Michael J. Andrejko
482nd MSG/CEV (786) 415-7344 DSN 535-7344

Date: 2.1> If r Za / '/

Chief, Environrnental Flight
Lawrence Ventura
482"d MSG/CEV (786) 415-7163 DSN 535-7163

Date: 25 APR 2014

Base Civil Engineer
Brent A. Hyden, Lt Col, USAFR
482nd MSG/BCE (786) 415-7323 DSN 535-7323

Date: 25 APR 2014

AFRC Command Entomologist
Mark S. Breidenbaugh, Lt. Col., USAFR
757 AS/DOS (330) 609-1965 DSN 346-1965

Date: Z7 /Jo tJ 2oi 3

Installation Commander
Christian G. Funk, Col., USAFR
482nd FW/CC (786) 415-7002 DSN 535-7002

Date: 7 May 2014

Date of Last AFRC On-site Review or ESOHCAMP: JAN 2010

2013
INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
HOMESTEAD AIR RESERVE BASE

TABLE OF CONTENTS

Section **Page No.**

2013
INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
HOMESTEAD AIR RESERVE BASE

TABLE OF CONTENTS (continued)

Section **Page No.**

LIST OF TABLES

Table **Page No.**

LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

AAFES – Army and Air Force Exchange System
AFASU – Air Force Aerial Spray Unit
AFB – Air Force Base
AFCEC—Air Force Civil Engineering Center
AFI—Air Force Instruction
AFPMB—Armed Forces Pest Management Board
AFRC—Air Force Reserve Command
APHIS – Animal Plant Health Inspection Services
ARB—Air Reserve Base
AS – Airlift Squadron
AW – Air Wing

BASH—Bird/Animal Aircraft Strike Hazard
BCE—Base Civil Engineer **BEE**—
Bioenvironmental Engineering **BOS**—Base
Operations Services
BX—Base Exchange

CC – Wing Commander
CEC – Civil Engineering Flight
CEV - Civil Engineering Environmental Flight

DoD - Department of Defense
DoDI - Department of Defense Instruction
DOS – Department of Spray
DSN – Defense Switchboard Network

EA – Environmental Assessment
EO – Executive Order
ESOHCAMP— Environmental, Safety, Occupational Health Compliance Assessment & Management Program

F – Fahrenheit
FANG—Florida Air National Guard
FL DoA -Florida Department of Agriculture
FONSI – Finding Of No Significant Impact
FS – Fighter Squadron
ft - feet
FW - Fighter Wing

HAZMAT – Hazardous Materials
HMMP - Hazardous Materials Management Program
HQ – Headquarters

IGR – Insect Growth Regulator
IPM - Integrated Pest Management
IPMC – Installation Pest Management Coordinator
IPMIS - Integrated Pest Management Information System
IRT – Innovative Readiness Training

MAJCOM – Major Command
MoM- Measures of Merit
MSDS - Material Safety Data Sheet
MSG- Mission Support Group
msl – mean sea level (in ft)
MSST – Maritime Safety and Security Team

NORAD - North American Aerospace Defense Command

OSHA - Occupational Safety & Health Administration

PMC – Pest Management Consultant
PPE – Personal Protection Equipment
PWS -Performance Work Statement

QAE -Quality Assurance Evaluator

SOCSOUTH – United States Army Special Operations Command South
SOUTHCOM – United State Southern Command
SOW - Statement of Work

TG – Technical Guide

USAF - United States Air Force
USAFR – United States Air Force Reserve
USCBP – United States Custom and Border Protection
USCG – United States Coast Guard
USDA - United States Department of Agriculture
USFWS - United States Fish and Wildlife Service

1. INTRODUCTION

1.1 Purpose

This document is designed to provide the guidance necessary for Homestead Air Reserve Base (ARB) to meet Department of Defense (DoD) and United States Air Force (USAF) policy requirements for pest management, as detailed in DoD Instruction (DoDI) 4150.07, *DoD Pest Management Program* (29 May 2008), and Air Force Instruction (AFI) 32-1053, *Pest Management Program* (23 June 2009). The goal is to establish a safe, effective, and environmentally sound Integrated Pest Management (IPM) Program. The IPM consists of the judicious use of both nonchemical and chemical control techniques to reduce pest populations to an acceptable level with minimal contamination.

The IPM program is designed to prevent pests and disease vectors from adversely impacting Air Force military operations and missions, while using environmentally sound techniques to safely and effectively control them. The following steps provide the recommended process for addressing any pest problem in a manner that supports IPM:

- Analyze the pest problem;
- Implement short-term, corrective action;
- Implement long-term, preventive action;
- Monitor, document, and evaluate results; and
- Educate base personnel.

1.2 Mission

The 482nd Fighter Wing (FW), a part of the Air Force Reserve Command (AFRC), is the host unit at Homestead ARB and is responsible for the maintenance and operation of the base, including the taxiways and runways. The 482nd FW provides ready access as a strategic staging location on the rim of the Caribbean Basin and supports contingency and training operations associated with the United States Southern Command (SOUTHCOM) area of responsibility. The 93rd Fighter Squadron (FS) flies and maintains the F-16C Fighting Falcon aircraft at Homestead ARB.

The 482nd FW supports specialized tenants such as the:

- Headquarters (HQ) for the Special Operations Command South (SOCSOUTH), a part of SOUTHCOM, and

- 24-7 alert facility of Detachment 1, 125th FW of the Florida Air National Guard (FANG), which works in conjunction with the North American Aerospace Defense Command (NORAD).

The 482nd FW also supports other government agencies such as the:

- Miami Air Branch of the U.S. Customs and Border Protection (USCBP),

- U.S. Coast Guard (USCG) Maritime Safety and Security Team Miami (MSST 91114), and

- ARFC's "Hurricane Hunters" weather reconnaissance mission.

In addition, the 482nd FW supports and trains civil engineering, communications, medical, logistics, aircraft maintenance, mission support, and aerial port and security police squadrons that can be used interchangeably with active-duty units to meet U.S. Air Force responsibilities around the world.

1.3 Installation

Homestead ARB is located within southeastern Miami-Dade County near the southern tip of the Florida peninsula. Homestead ARB is located near U.S. Highway 1 approximately 25 miles southwest of Miami, immediately east of the eastern boundary of the city of Homestead, and two miles west of Biscayne Bay. Homestead ARB is bordered on the north and northeast by portions of the former Homestead AFB, on the south and east by agricultural land, and on the west by residential and agricultural lands.

Homestead ARB is located along the flank of the Atlantic Coastal Ridge and the Southern Coastal Slope, which are subdivisions of the southern distal zone of the Atlantic Coastal Plain physiographic province. The surface topography at the base is relatively flat, with elevations ranging from two feet (ft) above mean sea level (msl) to 10 ft-msl.

The prevailing weather pattern at Homestead ARB is typical of subtropical climates. The average annual temperature is 76° Fahrenheit (F), with more than 30 days reaching temperatures above 90°F. The mean annual precipitation is approximately 60 inches, with 70 percent of the rainfall occurring during the wet season months between May and October.

Homestead ARB encompasses a total of 1950 acres of former Homestead Air Force Base (AFB) property. As in other parts of South Florida, because of the flat topography and low elevation, the base has an extensive fresh-water canal drainage system (total of approximately 80,000 linear feet), consisting of a series of drainage ditches and canals within and along the base boundary. Other aquatic environments on base include three artificial lakes (Twin Lakes and Phantom Lake) and a storm-water reservoir. All surface-water runoff is eventually directed into the Boundary Canal Drainage System which empties into the storm-water reservoir located at the south east corner of the base. From here, during the rainy season, the water flows into a two-mile long canal (Military Canal) that drains into Biscayne Bay.

In addition to the aforementioned lakes and canals, there are 223 acres of delineated jurisdictional wetlands present within the boundaries of Homestead ARB, the majority of which are located in and around the airfield. About 62 acres of the subject wetlands are located within

the infield between the main taxiway and runway, with most of the remaining acreage situated to the southeast of the runway.

The Homestead ARB pest management program uses two commercial pest control contractors. The first contractor (Sharp Shot, Inc.) is used to control insects and rodents within buildings and other real properties, and to do herbicide application along the runway and taxiways. The second contractor (Maintenance Engineers), the grounds maintenance contractor, is used for control of unwanted vegetation and herbicide application along the base's perimeter fenceline. The Miami-Dade Public Works Department is contracted to control mosquitoes by means of fogging trucks.

The two commercial contractors are:

1. Sharp Shot, Inc. (Base Operations Support [BOS] contractor)
   6983 S.W. 151 Street
   Miami, FL 33158

2. Maintenance Engineers (Grounds maintenance contractor)
   8901 E. Pima Center Parkway, #225
   Scottsdale, AZ 85828

Pests included in the base's management program are weeds and aquatic vegetation, mosquitoes, wasps and bees, crawling insects (ants, cockroaches, termites, etc.), and various small (mice and rats) and large (opossums and raccoons) mammalian pests.

Birds and larger animals (e.g., foxes, feral dogs, caimans, etc.) on and around the airfield also pose a significant potential for aircraft damage as a Bird/Animal Aircraft Strike Hazard (BASH). The BASH program is subcontracted out to wildlife biologists associated with the United States Department of Agriculture (USDA) Animal Public Health Inspection Services (APHIS). Their field activities operate under a United States Federal Wildlife Services (USFWS) Depredation Permit, which is renewed on an annual basis. Under their contract, the USDA-APHIS personnel are responsible for control, removal, and disposal of all large nuisance animals.

In addition to flying birds around the airfield, nesting birds and bats can also create a nuisance and health hazard in the hangars and other open structured buildings. Without control, these pests could interfere with the military mission, damage real property, increase maintenance costs, and expose installation personnel to diseases.

2.1 PEST MANAGEMENT PROGRAM RESPONSIBILITIES

The responsibilities listed below highlight roles applicable to HQ AFRC and Homestead ARB. The complete list of responsibilities is included in Air Force Instruction (AFI) 32-1053 (Appendix A).

2.2 Air Force Reserve Command (AFRC)

1) Reviews installation pest management programs on-site at least once every three years. This review uses the Major Command (MAJCOM) Environmental Safety Occupational Health Compliance Assessment and Management Program (ESOHCAMP) Checklist and applicable sections of Armed Forces Pest management Board (AFPMB) Technical Guide (TG) No. 18, *Installation Pest Management Program Guide*, to conduct this evaluation.

2) Performs annual reviews of installation Pest Management Plans for adherence to DoD and Air Force Policy. Accomplished through MAJCOM Pest Management Consultant (PMC).

3) Collects annual Measure of Merit (MoM) data from installations, and forwards it to the Air Force Civil Engineering Center (AFCEC).

4) Reviews the Statements of Work (SOW) and obtains technical approval from the AFRC PMC prior to soliciting service contracts which include pest control and pesticide application requirements.

2.3 Installation Pest Management Coordinator (IPMC)

1) Implements and coordinates the installation pest management program as outlined in this plan.

2) Represents, through official designation, the Base Civil Engineer (BCE).

3) Ensures only certified personnel apply pesticides on the installation.

4) Ensures only authorized pesticides are applied on the installation.

5) Ensures the Integrated Pest Management Information System (IPMIS) computer pesticide database is being maintained and data from all pesticide applications are entered.

6) Prepares the annual MoM report for HQ AFRC using pesticide application data extracted from the IPMIS.

2.4 Pest Management Quality Assurance Evaluator (QAE)

Homestead ARB does not utilize a Pest Management QAE. The installation falls below the required guidance threshold of 0.25 work-years under the base contracts.

2.5 Bioenvironmental Engineer (BEE)

1) Determines the type, source, and prevalence of disease vectors and pests, which may affect the health and productivity of installation personnel.

2) Recommends preventative control measures for health-related pests that impact base personnel, and monitors the effectiveness of the contractor-performed pest management efforts on the pest populations.

3) Evaluates potential occupational exposures and the adequacy of exposure controls to protect installation personnel, through on-site visits in those areas where pesticides are applied.

3.1 PEST MANAGEMENT STRATEGIES

The general overall strategy for treatment of pests at Homestead ARB is to use staged levels of response. Physical or cultural control measures are emphasized as the preferred methods of control and are applied first. Chemicals are only used if necessary and are always minimally applied, as required, to control the pest. Integration of these levels of response will result in pest control with a minimum impact on the environment.

Anticipated potential pest problems for Homestead ARB (including the flight line) consist of the following:

- Broadleaf and aquatic weeds,
- Mosquitoes,
- Wasps and bees,
- Cockroaches,
- Ants,
- Dry wood and subterranean termites,
- Spiders and scorpions,
- Rodents,
- Feral cats and dogs,
- Gulls, vultures, and egrets (BASH),
- Miscellaneous large mammals (raccoons, opossums, coyotes, foxes),
- Native large reptiles (alligators and crocodiles), and
- Non-native large reptiles (caimans, iguanas, monitor lizards, and snakes).

The following discussions cover the various pests known to be present at Homestead ARB but are not discussed in any order of prevalence.

3.2 Disease Vectors and Other Health-Related Pests

3.1.1 Mosquitoes

Mosquitoes are seasonal pests and are one of the major pest problems within the Homestead ARB cantonment area. Mosquito-breeding habitat may be found in roadway and parking lot drainage grates, holding ponds, drainage canals, outfalls, and wetlands areas. Since the early 2000s, there have been a number of cases of West Nile virus and Equine encephalitis within Miami-Dade County. West Nile virus and other encephalitides will continue to be the main mosquito-borne disease concern at Homestead ARB and South Florida. Nuisance mosquito bites are also a pest control issue and a work inhibitor to aircraft maintenance personnel in the aircraft hangers.

In the short term, adult mosquitoes require fogging for control on the main cantonment area if the insect creates a major problem. Additionally, Homestead ARB is established as a routine aerial spray mission in cooperation with the Air Force Aerial Spray Unit (AFASU), 910th Air

Wing (AW) W Youngstown OH) in accordance with AFI 32-1074 *The Aerial Application of Pesticides* (27 Aug 2009) and an Environmental Assessment (EA) with a Finding of No Significant Impact (FONSI), dated Jul 2008 (Appendix B). The aerial spray mission is supported by the Miami-Dade County Public Works Mosquito Control Division through an Innovative Readiness Training (IRT) agreement between the County and the AFRC. The county conducts extensive mosquito monitoring in areas surround the base and shares this data with Homestead ARB. Furthermore the IRT provides for the delivery of pesticides from the County to Homestead ARB to be utilized by AFASU to treat county and Homestead ARB infested areas for adult mosquitoes. The long term strategy is to:

- eliminate standing water to assist with mosquito control (e.g., rainwater in open containers) ,
- conduct periodic surveys of larval populations, and
- apply a larvicide to regular breeding areas if survey results suggest this course of action.

3.1.2 Wasps and Bees

Wasps and bees may be found on the installation on an infrequent basis throughout the year. The stings are painful and may cause allergic reactions in some people. Overall, these insects are a minor problem on Homestead ARB. The short-term strategy is to use a contact spray in sensitive areas or a residual type insecticide in other areas, if required. Because of the random, and infrequent, nature of the infestations, a long-term strategy is not required.

3.1.3 Honey Bees

Honey bees are one of the most beneficial of all insects. They are important pollinators of local cash crops within the surrounding agricultural lands around the base and within the general Homestead area. Due to their value, if a swarm or hive of honey bees appears on base, we will use the following steps to deal with it:

- To the extent possible, do not disturb it;
- If the swarm is in a remote location and not threatening people, wait for it to migrate away on its own;
- If the swarm poses a risk to people or facilities, a local beekeeper will be contacted to remove the swarm;.
- More detailed information regarding bees can be found in AFPMB TG-34 *Bee Resource Manual with Emphasis on the Africanized Bee*.

3.1.4 Fire Ants

Fire ants (*Solenopsis invicta*) have been found in Florida almost as far back as their introduction in the United States. They tend to form colonies in the more open grassy areas at Homestead ARB. The stings are painful and may cause allergic reactions in some people. These insects are only a minor problem within the more developed portions of Homestead ARB, but pose a significant problem to base personnel within the more open undeveloped portions of the base. Insect growth regulators such as Award or Logic or slow-acting bait such as AMDRO are the preferred agents to control fire ants pests.

3.2 Household and Nuisance Pests

Ants, cockroaches, spiders and scorpions may require control in billets, food service facilities, warehouses, offices and administrative buildings.

3.2.1 Cockroaches

Roaches can be a problem for building occupants and are usually prevalent in food preparation facilities. In response to complaints from building occupants, the pest management coordinator will arrange to have the BOS contractor or their subcontractor to perform the surveys and inspections to determine the extent of the problem.

Short-term strategy requires immediate response to positive surveys for cockroaches. Pesticide spot treatments are used when immediate control is required. Bait stations, growth regulators, contact, and residual pesticides may be used as needed depending on severity of the problem. Area-specific formulations may be used in areas where cockroaches reside, such as equipment voids, cracks, crevices, and other appropriate areas.

Long-term strategy focuses on incorporating on-going regular surveillance and the prevention of infestations through structural modifications and use of good sanitation practices. Structural modifications are relatively minor and consist of:

- Caulking (or filling) minor cracks and crevices;
- Patching holes in walls and floors; and
- Screening, if appropriate, to eliminate small openings.

Good sanitation practices are most important to prevent infestations. These include, but are not limited to:

- Cleaning up food preparation and eating areas after use;
- Keeping food stored in sealed containers; and
- Empting trash containers from buildings daily.

3.2.2 Spiders and Scorpions

These invertebrates are often found in undisturbed places in and around the various buildings. Few complaints are received regarding spiders. The short-term strategy in the event of complaint is to survey the site. Appropriate response actions typically include application of a contact pesticide. Depending on the circumstances, a residual pesticide may be applied. No long-term strategy is required.

3.2.3 Common Ants

Generally, the majority of complaints regarding the presence of ants are centered in food, lodging, or office areas. In the short term, on-site surveys are made in response to complaints. Based on survey results, the use of species-specific baits or gels may be used. Long-term control requires enhanced sanitation practices and physical control. External cracks and holes in the building should be covered or caulked. Ants are attracted to food, so the use of good food-sanitation practices should be emphasized. Granular bates, such as Maxforce, should be used around the outside of structures if required.

3.2.4 Bed Bugs

Bed bugs have become a pest of concern to the military with the hospitality industry reporting resurgence in such infestations. Surveillance should be ongoing by the housekeeping staff visually observing for signs. At the first sign of suspected bed bug activity, the room should be quarantined and all access should be prevented. If such a complaint is found to be supported by positive identification of the pest, the room should be isolated and treated by the BOS pest contractor. Non-chemical methods should be considered for cleaning bedding and mattresses, such as heat treating/steam cleaning. Further direction and guidance is given in the AFPMB's TG44, *Bed Bugs-Importance, Biology, and Control Strategies*.

.

3.3. Real Property Pests (Structural and Wood Destroying Pests)

In addition to the eastern subterranean termite (*Reticulitermes flavipes*), the southeastern drywood termite (*Incisitermes snyderi*) is common to the coastal and southern areas of Florida. More recently, another species of termite, the Formosan termite (*Captotermes formosanus*) has begun to make its appearance in some parts of Miami-Dade County.

For facilities of concern, the short-term strategy for infestations will be use of insect baits such as growth regulators (IGR) or chitin synthesis inhibitor incorporated into a cellulosic matrix. Sulfuryl floride (Vikane) should only be used for drywood termites and isolated aerial colonies of Formosan termites, as necessary. Baiting in itself is a long-term strategy when linked with regular surveying and monitoring for infestations. Short-term strategies should use contact insecticides using barrier (fill or sub-slab injections) or drill and treat or localized broadcast applications. Either the BOS contractor or their subcontractor will perform these surveys and inspections.

3.4 Vegetative Pests

3.4.1 Nuisance Weeds

A variety of nuisance weeds typically grow on landscaped areas throughout the base. The presence of weeds is an aesthetic concern, as well as a threat to the health of turfed areas and other planted shrubbery. Weeds are also a concern to facilities when they propagate along expansion and other joints in asphalt and concrete pavement on the base. The BOS contractor will perform corrective action for weed growth within the developed portions of the base and along the runway and taxiways.

The corrective actions consist of using both pre and post-emergent herbicides. This strategy also includes the use of spot applications of non-selective herbicides applied to fences, curb lines and sidewalk joints. Homestead ARB has an active program to control weeds in asphalt and concrete expansion joints for the base roads, taxiways, apron, and runway.

3.4.2 Invasive Species

Invasive, non-native species are considered one of the most significant threats to natural communities and biodiversity today. These aggressive species typically occur on disturbed sites where past or current land uses have resulted in disturbed soils and loss of native vegetative cover. Invasive, non-native species have also been intentionally introduced for erosion control, aesthetics, or wildlife food plots. A number of plant species documented as being present at Homestead ARB are invasive, non-native species and are listed as top ten exotic pest plants or other important pest plants by the Florida Exotic Pest Plant Council (2011). In addition, the base is required to be in compliance with Executive Order (EO) 13112, *Invasive Species* (FEB 1999).

The most widespread and pervasive of these invasive plants are Australian pine (*Casuarina equisetifolia*), Bishopwood (*Bischofia javanica*), Brazilian pepper (*Schinus terebinthifolius*), Burma reed (*Neyraudia reynaudiana*), and Lead tree (*Leucaena leucocephala*). Over the past few years, there have been several vegetation removal contracts to get rid of the dense stands of non-native vegetation that once existed on the east side of the runway and which presented both a BASH problem and a definite wildfire hazard. In addition, a noxious weed new to the United States, golden false beardgrass (*Chrysopogon aciculatus*) was recently discovered within the mowed grassy areas near the approach lights for the south (05) end of the runway. The initial eradication of this new invasive plant was accomplished through the cooperative effort of field personnel from the National Park Service's Florida/ Caribbean Exotic Plant Management Team, the Florida Department of Agriculture and Consumer Services, Division of Plant Industry, and the USDA-APHIS BASH personnel.

Continued monitoring and treatment has been implemented for the long-term control of all of the aforementioned invasive plant species. Total eradication, however, would be extremely difficult because of their definite presence and occurrence within surrounding and nearby off-base parcels. Homestead ARB has elected to focus control efforts on eliminating them in ecologically significant areas and/or those areas that might pose BASH problems (e.g., attractant for roosting

birds) or security problems (e.g., perimeter fence lines) thus preventing their spread to new areas as the more practicable alternative.

Invasive species are controlled via the grounds maintenance contracts for Homestead ARB. Herbicides are applied, as necessary, as part of the Homestead ARB IPM approach to managing invasive plant species. The type of herbicide applied and methodology vary depending on periodic surveys and success from previous seasons' control measures. Long-term monitoring will continue for these plant species.

3.5 Vertebrate Pests

3.5.1 Large Aquatic/Wading Birds

With over 80,000 linear feet of drainage ditches and canals, 223 acres of jurisdictional wetlands, three artificial lakes, and a storm-water reservoir within Homestead ARB cantonment area, there are ample places on base for various aquatic and wading birds to reside, feed, or visit during migration periods. Such birds are considered potential pests due to the BASH risk they pose. Corrective action for bird control is determined by the BASH team who utilize a variety of methods to minimize risk to aircraft from these animals. These methods may include trapping, pyrotechnics, or depredation as deemed appropriate by the BASH team.

3.5.2 Other Birds

Populations of native vultures consist of both local and transient birds. Numbers increase significantly during the winter season as migrating vultures tend to congregate around the nearby South Dade Landfill. As potential BASH issues, they are addressed in a manner similar to aquatic/wading birds.

While other birds (e.g., owls, grackles, etc.) may present a problem by nesting in hangars, this is not a significant issue at Homestead ARB. In the event this becomes an issue, effective management can include exclusion netting, roost diversion implements, the use of an avian aversion agent, or even depredation shooting.

3.5.3 Rodents and Mammals

Preventative action includes reducing the attractants for these pests by:

- Proper solid waste management, especially within food service facilities;
- Elimination of unnecessary debris around the exterior of facilities; and
- Sealing pest entryways, when possible.

Glue boards and traps can be used effectively to control both mice and rats. Such small rodents will be controlled first with traps, then, if necessary, with rodenticides.

Other small mammals are intermittent problems on the base. These include, but are not limited to

raccoons, squirrels, and opossums. In addition, larger mammals such as bob cats, coyotes and gray foxes have been documented at Homestead ARB occasionally at various places near the runway and munitions storage area. Management of these pests includes a preference of live trapping and relocation. Stray dogs and cats are to be captured and removed from the installation. Dead animals found on-base must be removed and disposed of while wearing proper personal protective equipment (PPE).

3.5.4 Large Reptiles

The various on-base aquatic features are home to nesting populations of two native crocodilian species, the American crocodile and the American alligator, and one non-native species, the Spectacled caiman. In addition, other large non-native mega-reptiles, such as the Nile monitor lizard and the Green iguana, also regularly occur along the outer portions of the Boundary Canal Drainage System. Individual native crocodilians that wander onto the runway or aircraft hangers are captured and relocated to other areas on base for release. Caimans, monitors, and iguanas found within the same areas are captured and removed via depredation by the on-base USDA-APHIS BASH personnel.

3.6 Federal and State-Listed Protected Species

Because of its unique location between two National Parks (Everglades to the west and Biscayne to the east) a number of studies have been performed over the years to verify and document the presence of any federal or state-listed threatened or endangered species within Homestead ARB. Two of the following tables list the federal-listed (Tables 3-1) and state-listed (Table 3-2) animal and plant species found within Homestead ARB. The third table (Table 3-3) lists several federal-listed butterflies previously known to be present within the immediate base vicinity.

Table 3-1: Federal-Listed Animal & Plant Species Observed On Homestead ARB Property

Common Name	Scientific Name	Status
American crocodile	*Crocodylus acutus*	Threatened
Eastern indigo snake	*Drymarchon corais couperi*	Threatened
Florida (West Indian) manatee	*Trichechus manatus*	Endangered
Bald eagle	*Haliaeetus leucocephalus*	Threatened
Everglades snail kite	*Rostrhamus socialibis plumbus*	Endangered
Least tern	*Sterna antillarum*	Endangered
Roseate tern	*Sterna dougallii dougallii*	Threatened
Wood stork	*Mycteria americana*	Endangered
Small's milk pea	*Galactia smallii*	Endangered
Sand flax	*Linum arenicola*	Candidate

Table 3-2: Federal-Listed Animal Species Reported Near Homestead ARB*

Common Name	Scientific Name	Status
Miami Blue Butterfly*	*Cyclargus thomasi bethunbakeri*	Endangered
Schaus Swallowtail Butterfly*	*Heraclides aristodemus ponceanus*	Endangered
Bartram's Scrub-Hairstreak*	*Strymon acis bartrami*	Candidate
Florida Leafwing*	*Anaea troglodyta floridalis*	Candidate

***** Based on recent USFWS and University of Florida studies

Table 3-3: State-Listed Animal and Plant Species Observed On Homestead ARB

Common Name	Scientific Name
Black skimmer	*Rynchops niger*
Brown pelican	*Pelecanus occidentalis*
Florida burrowing owl	*Athene cunicularia floridana*
Least tern	*Sterna antillarum*
Little blue heron	*Egretta caerulea*
Peregrine falcon	*Falco peregrinus tundrius*
Reddish egret	*Egretta rufescens*
Snowy egret	*Egretta thula*
Southeastern American kestrel	*Falco sparverius paulus*
Tricolored heron	*Egretta tricolor*
White-crowned pidgeon	*Patagioenas leucocephala*
White ibis	*Eudocimus albus*
Bahama ladder brake	*Pteris bahamensis*
Bahama senna	*Senna mexicana var. chapmanii*
Blodgett's swallowwort	*Cynanchum blodgettii*
Eaton's spike-moss	*Selaginella armata var. eatonii*
Everglades false buttonweed	*Spermacoce terminalis*
Everglades greenbriar	*Smilax havanensis*
Everglades key pencilflower	*Stylosanthes calcicola*
Florida silverpalm	*Coccothrinax argentata*
Havana scullcap	*Scutellaria havanesis*
Locust berry	*Byrsonima lucida*
Long-stalked stopper	*Psidium longipes*
Man-in-the-ground	*Ipomoea microdactyla*
Pineland black anthers	*Melanthera parvifolia*
Pineland cluster vine	*Jacquemontia curtisii*
Pineland golden trumphet	*Angadenia berteroi*
Pinepink	*Bletia purpurea*
Quail berry	*Crosspetalum ilicifolium*
Rockland shrub verbena	*Lantana depressa*
Sand flax	*Linum arenicola*
Small-leaf snoutbean	*Rynchosia parvifolia*
Small's milkpea	*Galactia smallii*
Southern fogfruit	*Phyla stoechadifolia*
Wedgelet fern	*Odontosoria clavata*
White sunbonnets	*Chaptalia albicans*
Dade County slash pine	*Pinus elliottii var. densa*

4.1 PEST MANAGEMENT PROGRAM EXECUTION

4.2 Contracts and Support Agreements

All pest management operations, including herbicide application along the runway and taxiways at Homestead ARB are contracted out to the BOS contractor. Contract requirements are outlined in the contract's Performance Work Statement (PWS) which allow for the flexibility to subcontract out all or part of the pest management responsibilities.

Monitoring and evaluation of pest management operations is performed by the BOS QAE. The BOS QAE monitors all BOS real property requirements including pest management and subcontracts. Homestead ARB does not maintain a separate QAE for pest management. Homestead ARB performs less than 0.25 work-years of IPM operations.

Control for vegetative invasive species is contracted out separately under the basewide grounds maintenance contract. This program is managed by the base's contracting office and the designated project manager within the Civil Engineering Flight (CEC).

The 482nd FW hosts a number of tenant organizations. Each tenant has a written support agreement with the host unit on base stating as to what services are supported by Homestead ARB. Only the two tenant organizations listed below receive pest management operations from the base:

- HQ and storage buildings for the SOCSOUTH, and
- 24-7 alert facility of Detachment 1, 125th FW of the FANG.

4.3 Storage and Mixing

There are no facilities available within Homestead ARB that are designed or designated to be used as a pesticide/herbicide mixing and storage facility. The BOS and Grounds Maintenance contractor are not permitted to store herbicides on base prior to application. The herbicides are to be kept off base at the individual contractor's own controlled facility. All empty pesticides/herbicide containers are to be cleaned out and properly disposed of off base.

4.4 Authorization, Reports, and Recordkeeping

Pesticides used within Homestead ARB are considered as Hazardous Materials (HAZMATs). As such, their presence on base requires proper authorization prior to being brought on base to be in compliance with the base's Hazardous Material Management Program (HMMP).

Applicators using pesticides and herbicides on Homestead ARB are required to comply with Occupational Safety and Health Administration (OSHA) regulations requiring hazardous material information availability. This would include the most updated and product-specific approved pesticide Material Safety Data Sheet (MSDS) and label information for quick reference. It should be noted that only DoD or base-specific authorized pesticides may be used within Homestead ARB. See Appendix C for the aforementioned current lists of approved

pesticides. If conditions arise that require the need for use of a non-listed pesticide, the contractor can submit a "Request for Approval of New Pesticide" to the Command Pest Management Professional for review and approval. However, until final approval is received, the subject proposed alternative pesticide cannot be used. A copy of the subject request form can be found in Appendix D.

Pesticide application logs are required to be submitted to the installation pest management coordinator on a monthly basis. The application log (Appendix E) includes the following information: Name of Applicator (and Company if applicable), Date of Application, Facility, Target Pest, Product, Quantity, & Mixture. After receiving all application data for a given month, the pest management coordinator shall enter the information into the current version of IPMIS software. This data is used to develop the annual MoM report for HQ AFRC.

4.5 Certification and Training

All personnel who apply pesticides on the installation shall be trained and certified in accordance with DoD or State requirements. Commercial pesticide applicators working under contract must be licensed by the State of Florida for the type of pest control applications they perform. Florida certification rules allow for individuals to apply under their supervisors' license. Appendix F contains copies of active applicator certifications for installation work.

Homestead ARB does not exceed the 0.25 man-year threshold of total pesticide applications to warrant certification training for the Pest Management QAE. Formal education and awareness activities are not scheduled to be conducted.. Internet-based, case-specific training may be performed for special circumstances (e.g., West Nile virus awareness). There are options for online training for QAEs if thresholds increase.

4.6 Health and Safety

To reduce potential hazards to personnel on the base and public off base, the following requirements are instituted under this integrated pest management plan:

- Pesticides are not applied outdoors when wind speed exceeds 10 miles per hour, especially in and around the airfield;
- Treated areas shall be posted in accordance with Florida regulations;
- Pesticides will only be used in accordance with product label and instructions;
- "Self Help" pesticide applications are prohibited on Homestead ARB; and
- Qualified applicators will wear PPE and use proper equipment when applying pesticides.

4.7 Disposal

All pesticide related materials will be handled and disposed of in accordance with federal, state, and local regulations in addition to the Homestead ARB HMMP. No disposal of unused

pesticide-related materials, empty containers, or rinsate is permitted on base. It is the contractors' responsibility to dispose of the above materials in a regulatory acceptable manner off base.

4.8 Base Exchange

At one time, the Base Exchange (BX) in Building 920, owned and administered by the Army and Air Force Exchange Service (AAFES), offered a wide range of pesticide products for residential use. Currently, only a portion of the subject building is used by AAFES to run a small Shoppette. No general use insecticides, herbicides, or insect repellent products are offered for sale to customers.

4.9 Aircraft Disinsection

Currently, there are no personnel at Homestead ARB trained or qualified to perform aircraft disinsection.

4.10 Surveillance

Chemical applications, along with other integrated pest management techniques, are implemented on Homestead ARB as a result of analysis of observations and historical data at the site related to the pest. The applicators survey areas prior to treatment in order to assess the problem. Due to operational changes on the installation along with personnel, programmatic and logistical issues related to tracking pesticides, data prior to January 2013 is considered unreliable and not used for reference or analysis.

APPENDIX A

AFI 32-1053, PEST MANAGEMENT PROGRAM (23 JUN 2009)

BY ORDER OF THE
SECRETARY OF THE AIR FORCE

AIR FORCE INSTRUCTION 32-1053
23 JUNE 2009
Certified Current 11 April 2013
Civil Engineering

INTEGRATED PEST MANAGEMENT PROGRAM

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

OPR: HQ AFCESA/CEOA

Certified by: HQ AF/A7CA
(Col Liesel A. Golden)

Supersedes: AFI 32-1053, 1 April 1999

Pages: 24

This instruction provides guidance for pest management programs at Air Force installations. It implements Air Force policy directive (AFPD) 32-10, *Installations and Facilities*, 27 March 1995, and Department of Defense Instruction (DODI) 4150.07, *DOD Pest Management Program*, 29 May 2008. Use this guidance in the United States and its territories in conjunction with applicable Federal, state, and local laws and regulations. For installations outside the United States and its territories, compliance requirements within the Overseas Environmental Baseline Guidance Document (OEBGD) or the Final Governing Standards (FGS) for the host country take precedence over this instruction. This publication applies to Air Force Reserve Command (AFRC) and Air National Guard (ANG) Units. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with AFMAN 33-363, *Management of Records*, and disposed of in accordance with the AFRIMS (Air Force Records Information Management System) Records Disposition Schedule (RDS) located at **https://www.my.af.mil/gcss-af61a/afrims/afrims**/. Users should send comments and suggested improvements on AF IMT 847, *Recommendation for Change of Publication*, through major commands (MAJCOM) and HQ AFCESA, 139 Barnes Drive, Suite 1, Tyndall AFB, FL 32403-5319, to HQ USAF/A7C, 1260 Air Force Pentagon, Washington, D.C. 20330-1260. Any organization may supplement this instruction. MAJCOMs, FOAs and DRUs must send one copy of each supplement to HQ AFCESA/CEO; other commands send one copy of each supplement to the next higher headquarters.

SUMMARY OF CHANGES

This document is substantially revised and must be completely reviewed. This revision updates, clarifies, and streamlines previous guidance on pest management; further emphasizes use of integrated pest management (IPM) programs to prevent or control pest and disease vectors; and adds new guidance on managing invasive species, using pesticides near threatened/endangered species habitats, pesticide security and reporting, contracts, and use of pesticides during contingency operations. This revision identifies civil engineer squadron commander and/or installation civil engineer responsibilities. It also implements changes due to DODI 4150.07, *DOD Pest Management Program*, 29 May 2008.

1. Background. Air Force pest management programs are essential to prevent pest and disease vectors from adversely affecting military operations in peacetime and during contingency operations. Safe, effective, and environmentally sound IPM programs reduce pollution and other risk factors associated with pesticide use.

2. Objectives. The objectives of the Air Force pest management programs are to meet or exceed DOD pest management Measures of Merit (MoM), and promote and support the following:

2.1. Military readiness.

2.2. Installation program planning and maintenance.

2.3. Pollution prevention, conservation of natural/cultural resources, and environmental compliance.

2.4. Integrated pest management (IPM).

3. Responsibilities.

3.1. **The Office of the Civil Engineer, Headquarters United States Air Force (HQ USAF/A7C).** Approve Air Force pest management policy. The National Guard Bureau/Civil Engineer (NGB/A7) approves Air National Guard (ANG) policy.

3.2. **Headquarters Air Force Civil Engineer Support Agency (HQ AFCESA).** Provide a pest management subject matter expert (SME) who acts as the Air Force senior pest management consultant and whose responsibilities are as follows:

3.2.1. Set standards, develop procedures, and provide technical assistance to implement Air Force policy and programs for in-service and contract pest management operations.

3.2.2. Coordinate with engineering and medical operations to ensure the Air Force has adequate combat pest management capability.

3.2.3. Ensure all MAJCOM pest management consultants (PMC) are currently certified in the appropriate DOD pest management categories.

3.2.4. Establish the Air Force self-help pest management program.

3.2.5. Coordinate with Headquarters Air Force Medical Support Agency (HQ AFMSA) Public Health Division (SG3PM) and Bioenvironmental Engineering Division (SG3PB) on aspects of the pest management program that present potential occupational and environmental health hazards. **Note:** ANG/A7AN provides comparable services for ANG installations.

3.2.6. Coordinate with DOD and Air Force for the development and maintenance of a computerized integrated pest management information system (IPMIS).

3.2.7. Forward contingency pest management records to the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) in accordance with DODI 6490.03, *Deployment Health*, for archiving in the Defense Occupational and Environmental Health Readiness System (DOEHRS).

3.2.8. Represent the Air Force Civil Engineer as a voting council member on the Armed Forces Pest Management Board (AFPMB) (**http://www.afpmb.org**).

3.2.9. Collect MAJCOM pest management data and analyze for Air Force-wide issues; consolidate and validate Air Force data for the DOD Pest Management (PM) MoM submittal; and forward through A7C to the AFPMB.

3.3. MAJCOM (through MAJCOM Pest Management Consultant [PMC]).

3.3.1. Implement pest management policies and programs for their installations.

3.3.2. Use the MAJCOM Environmental Safety Occupational Health Compliance Assessment and Management Program (ESOHCAMP) Pesticide Management Checklist and applicable sections of AFPMB Technical Guide (TG) No. 18, *Installation Pest Management Program Guide*, to assess the effectiveness of installation pest management programs; review installation pest management programs on-site at least every 36 months, and annually review installation pest management plans for adherence to DOD and Air Force policy.

3.3.3. Identify personnel needing pesticide applicator certification or recertification during the annual training survey.

3.3.4. Certify only military and DOD civilian pest management personnel who have met the training requirements (in-residence training, correspondence course, and on-the-job training) for pesticide applicator certification as specified in the AFPMB document, DOD 4150.07-M, Volume 1, *DOD Plan for the Certification of Pesticide Applicators.* (Provide all certified pest management personnel with DD Form 1826, *Certificate of Competency*, and DD Form 1826-1, *Pesticide Applicator Card*. Pesticide applicator certification is valid for three years from the date graduated from one of the following training classes:

Pest Management Apprentice, Pest Management Pesticide Applicator Recertification Training, or Pest Management Certification Training, unless revoked for cause.)

3.3.5. Review and approve installation pest management plans, pesticide requests, contract performance work statements, aerial spray projects, and facility design and/or upgrades.

3.3.6. Programs adequate resources to ensure program reviews, training, and compliance requirements are met.

3.3.7. Help installations implement the IPMIS computerized pesticide database, and annually forward the consolidated pest management data to HQ AFCESA/CEOA.

3.3.8. Consolidate base DOD PM MoM and Air Force Scorecard submittals, analyze for MAJCOM-wide issues, validate, and forward to HQ AFCESA/CEOA.

3.4. Air Force Installation Engineer/Civil Engineer Squadron Commander.

3.4.1. Provide oversight and support of all installation pest management programs in accordance with DOD, Federal, state, and legally applicable host nation laws.

3.4.2. Provide facilities, equipment, and pesticides in accordance with DODI 4150.07.

3.4.3. Provide the appropriate number of certified pest management personnel according to DODI 4150.07 and Air Force manpower standards to support contingency and installation requirements.

3.4.4. Provide financial resources for operations and training to meet installation and contingency pest management requirements.

3.4.5. Select (in writing) an installation pest management coordinator (IPMC**)** to oversee the development of installation pest management plans, collect and report data on all installation pesticide use, review contract specifications, and serve as the primary point of contact (POC) for all installation pesticide compliance.

3.4.6. Review and approve installation pest management plans and contracts.

3.4.7. Provide pest management support for installation facilities, grounds, airfield Bird/Wildlife Air Strike Hazard (BASH) mitigation measures, range operations, golf course maintenance (in accordance with AFI 65-106, *Appropriated Fund Support of Morale, Welfare, and Recreation [MWR] and Non-appropriated Fund Instrumentalities [NAFIS]*), recreation areas, etc.

3.5. **Air Force Installation Pest Management Supervisor/Coordinator.** The Air Force installation pest management supervisor/coordinator works in the civil engineering (CE) career field and is responsible for the installation's pest management program and performs the functions of the installation pest management coordinator as specified in DODI 4150.07.

3.5.1. Overall Responsibilities.

3.5.1.1. Work closely with other CE, services, medical personnel, and the MAJCOM PMC to produce an effective pest management program.

3.5.1.2. With assistance from the installation environmental office, coordinate with Federal, state, installation, local or host nation pest management, environmental, and wildlife personnel as necessary.

3.5.2. Regulatory Compliance.

3.5.2.1. Ensure pest management programs and facilities comply with all applicable Federal, state, and local laws, DOD instructions, and Air Force requirements; follow guidance in AFPMB TG No. 17, *Design of Pest Management Facilities*, for designing new facilities and renovating existing facilities; consult with bioenvironmental engineering personnel regarding the adequacy of the pest management facility to ensure it provides a safe work environment for pest management personnel.

3.5.2.2. Use pesticides approved in writing by the MAJCOM PMC in accordance with Environmental Protection Agency (EPA) label requirements.

3.5.2.3. Review the most recent ESOHCAMP Pesticide Management Checklists for guidance.

3.5.2.4. For overseas installations outside U.S. jurisdiction, apply the FGS as developed under DOD 4715.5G, *Overseas Environmental Baseline Guidance Pesticide Management Checklist*, for the host country; ensure host nation personnel receive non-FIFRA training in accordance with DODI 4150.07 and the FGS.

3.5.2.5. Follow guidance in AFI 32-1074, *Aerial Application of Pesticides*, for aerial application of pesticides.

3.5.3. Personnel Management.

3.5.3.1. Ensure only certified personnel (or uncertified but trained personnel that are under direct supervision of a certified applicator) apply pesticides according to guidance in DOD 4150.07-M, Vol. 1.

3.5.3.2. Oversee the training and pesticide applicator certification of peacetime and wartime pest management personnel (DOD and non-appropriated funded) according to the AFPMB document, DOD 4150.07-M, Vol. 1.

3.5.3.3. Schedule DOD pest management certification and recertification through the unit training manager from courses listed on the DOD Pest Management Training and Certification website (**http://www.afpmb.org/pubs/courses/courses.htm**); pesticide applicator recertification should be scheduled not later than six months prior to expiration.

3.5.3.4. Send requests for pesticide applicator certification or recertification, based on successful completion of training, to the MAJCOM PMC. **Note:** The losing MAJCOM will recertify permanent-change-of-station personnel before their departure if the pesticide applicator certification expires within, before, or after six months of their departure date.

3.5.3.5. Prisoners or volunteer workers may not be assigned to apply pesticides.

3.5.3.6. After receiving training from pest management personnel, non-pest management personnel may apply pesticides in the following situations:

3.5.3.6.1. Adult military housing occupants (non-privatized), facility building managers, and others specified within an approved installation IPM plan may apply approved self-help pesticides in accordance with the Air Force Self-Help Pest Management Program for Military Housing Occupants and Building Managers.

3.5.3.6.2. Military personnel may apply approved arthropod repellents (including individual dynamic absorption kits) for personnel protection and for use on uniforms, tents, and mosquito netting. Civilian personnel working outdoors may only apply repellents labeled for civilian use by the EPA to skin or clothing.

3.5.3.6.3. Military personnel may apply approved aerosol insecticide for quarantine insect extermination on aircraft after receiving training from the CE pest management section.

3.5.4. Preventing the Spread of Pests.

3.5.4.1. Take measures to prevent the movement of pests and disease vectors requiring quarantine in accordance with Air Force joint instruction (AFJI) 48-104, *Quarantine Regulations of the Armed Forces*.

3.5.4.2. Work with customs inspectors and loadmasters to ensure cargo is pest-free. **Note:** U.S. Department of Agriculture and U.S. Customs personnel provide critical assistance on retrograde pest-prevention procedures.

3.5.4.3. Disinfect aircraft using guidance in DOD Foreign Clearance Guides when directed by the aircraft commander.

3.5.4.4. Coordinate with local, state, and Federal agencies on cooperative agreements for managing invasive and noxious species on Air Force land in accordance with AFI 32-7064, *Integrated Natural Resources Management*, when state or private land in the same area has such programs.

3.5.5. Installation Pest Management Plan.

3.5.5.1. Make annual plan updates to the current list of certified applicators (DOD and state), pesticide inventory, and new standard operating procedures.

3.5.5.2. Make sure the plan addresses annual requirements, such as labor and integrated pest management measures to be used against each pest.

3.5.5.3. Include necessary attachments such as pesticide labels, material safety data sheets (MSDS), golf course integrated pest management plans, and agreements between appropriate state pesticide organizations and DOD. **Note:** Include any other unique pest management programs in this plan (e.g., BASH, invasive species management plans).

3.5.5.4. All pest management operations must be based on appropriate surveillance data. Vector surveillance data must be coordinated with public health, documented, and input into IPMIS.

3.5.5.5. If endangered species are present, coordinate the plan with the regional U.S. Fish and Wildlife Service office with the assistance of the installation natural

resources manager in accordance with AFI 32-7064. Overseas locations must comply with OEBGD and FGS for host nation wildlife protection.

3.5.5.6. In preparing this plan, follow format guidance in DODI 4150.07, Enclosure 5, or alternate direction from MAJCOMs. Ensure all activities such as ranges, radar sites, missile sites, recreation areas, and any other activities that employ pesticides are included in the plan.

3.5.5.7. This plan will be updated annually but is completely revised and formally staffed every five years with the following individuals:

3.5.5.7.1. Installation natural resources manager and/or pest management coordinator.

3.5.5.7.2. Installation environmental coordinator.

3.5.5.7.3. Public health officer.

3.5.5.7.4. Bioenvironmental engineer officer.

3.5.5.7.5. Installation civil engineer.

3.5.5.7.6. Mission support group commander.

3.5.5.7.7. Wing commander.

3.5.5.8. Provide an electronic copy of the plan to the MAJCOM for approval by the PMC.

3.5.6. Contingency Pest Management.

3.5.6.1. Use information in AFPMB TG No. 24, *Contingency Pest Management Pocket Guide*, to control disease vectors and pests during field situations worldwide. Civil engineer and operational unit commanders should be briefed by pest management and public health personnel to ensure adequate resources are allocated for protecting deployed personnel against disease vectors and pests.

3.5.6.2. Procure and use only pesticides listed in the DOD Contingency Pesticide List during contingency operations.

3.5.6.3. During emergency conditions, EPA-registered pesticides may be locally procured with the proper approval (in writing) from a pest management professional (PMP) designated by the task force surgeon. Requests for non-EPA registered pesticides must follow guidance on the AFPMB Contingency website (**http://www.afpmb.org/coweb/coweb.htm**).

3.5.6.4. Store contingency pesticides under the same controlled temperature, security, and other conditions as daily use pesticides.

3.5.6.5. Rotate contingency pesticide stocks back to pest management shop inventories and replace them with fresh chemicals as needed.

3.5.6.6. Use pest management contracts when cost effective or when advantageous for non-routine, large-scale, or emergency services, especially when specialized equipment or expertise is needed. Pest management consultants shall review and technically approve contract documents for pest management operations, including

augmentation contracts, to ensure they comply with status of forces agreements (SOFA), FGS, and OEBGD.

3.5.6.7. The contracting officer shall ensure that quality assurance evaluators (QAE) who inspect the performance of contractor-provided pest management services are DOD-trained in pest management or hold DOD pest management certification.

3.5.6.8. Work with public health personnel to ensure that all deploying CE and other Air Force personnel have and are trained to use insect repellents and permethrin-treated clothing for protection against disease vectors and pests likely to be encountered.

3.5.6.9. Coordinate with the medical intelligence officer to assess the health risks from disease vectors and other medically important pests.

3.5.6.10. Remove feral or wild animals in accordance with AFJI 48-131. Responsibilities of pest management, security forces, and veterinary or public health personnel should be clearly outlined in the installation pest management plan. BASH management must be coordinated with flight safety and airfield operations.

3.5.6.11. Removal and disposal of dead animals is the responsibility of pest management unless contracted out. Personnel that handle dead or dying animals must wear proper personal protective equipment for handling and disposing of the carcasses.

3.5.6.12. Report contingency pesticide use and pest surveillance through appropriate command channels or AOR PMC to HQ AFCESA/CEOA. Records will be forwarded to USACHPPM for archiving in DOEHRS.

3.5.7. Destructive Pests.

3.5.7.1. The installation pest management supervisor or QAE monitor shall report all property damage caused by pests, including to stored products, golf course, and forestry, so information can be recorded in the IPMIS.

3.5.7.2. Include termite inspection frequency in installation pest management plans.

3.5.8. Facility Maintenance and New Construction.

3.5.8.1. Operate a self-help pest management program for non-privatized military housing occupants when cost effective and when IPM monitoring indicates the need for a self-help program, following guidance from HQ AFCESA/CEOA.

3.5.8.2. Work with facility managers and occupants of buildings other than military family housing to control minor pests through good housekeeping (see paragraph 4.3) and self-help pest management products.

3.5.8.3. Work with other CE shops on facility maintenance and repair for control of pests.

3.5.8.4. Work with CE and other design agencies to ensure termite treatments are included in new construction and major renovation projects. When needed, use only non-repellent termiticides in accordance with Unified Facilities Guide Specification

(UFGS) 31 31 16, *Soil Treatment for Subterranean Termite Control*, applied at the highest EPA-labeled concentration and application rate.

3.5.8.5. Coordinate on all new construction and major renovation projects to ensure pest management problems are not built into facilities.

3.5.9. Protecting Personnel Health.

3.5.9.1. Ensure all personnel new to the career field receive a baseline physical exam before potential occupational exposure to pesticides, proper immunizations, and periodic occupational physical exams as directed by the occupational and environmental working group.

3.5.9.2. Protect the health and safety of pest management personnel through training (including initial and periodic occupational health and hazard communication [HAZCOM] training), emphasis on good work habits (such as using protective clothing and equipment), and construction that reduces or eliminates hazards. Assure that pregnant and breastfeeding pest management personnel have been referred to public health.

3.5.9.3. Provide protective clothing and equipment to all pest management personnel who mix and apply pesticides (see paragraph 4.4).

3.5.9.4. Notify public health before applying pesticides in food preparation and consumption facilities, medical facilities, and child development centers.

3.5.10. Coordinate with the bioenvironmental engineer by accomplishing the following:

3.5.10.1. Enroll all pesticide applicators into the respiratory protection program.

3.5.10.2. Ensure that bioenvironmental engineering receives:

3.5.10.2.1. A hard copy of installation pesticide inventories.

3.5.10.2.2. Pertinent MSDSs.

3.5.11. Environmental Protection.

3.5.11.1. Use recyclable and refillable pesticide containers and closed pesticide mixing and transfer systems as much as possible.

3.5.11.2. Do not inject insecticides into the soil to control subterranean termites in any military buildings with sub-slab or in-slab heating, ventilation, or air-conditioning ducts, unless permanent blocks are made to the ducts.

3.5.11.3. Manage pesticide rinsates in accordance with *EPA Guidelines for Responsible Pesticide Use* (**http://www.epa.sa.gov.au/pdfs/guide_pesticides.pdf**).

3.5.12. Safety.

3.5.12.1. Give the fire department a hardcopy of pest management, self-help, and golf course building location(s) and layout(s) indicating pesticide storage areas. Provide the fire department with a hardcopy of installation pesticide inventories and MSDSs annually.

3.5.12.2. Coordinate all fumigations with installation medical, fire, security forces, and safety personnel.

3.5.12.3. Do not use internal-combustion or electrical-power-driven spraying machines for aerosol or mist sprays inside buildings without approval from the bioenvironmental engineer and the installation fire chief.

3.5.12.4. Remove stray and feral animals in accordance with AFJI 48-131, AFI 32-7064, and AFPMB TG No. 37, *Guidelines for Reducing Feral/Stray Cat Populations on Military Installations in the United States*. Responsibilities of pest management, natural resources, security forces, and veterinary or public health personnel should be clearly outlined in the installation pest management plan. United States Department of Agriculture (USDA) Wildlife Services should be consulted on animal damage control and may be contracted to assist with management.

3.5.12.5. Stray animals should be captured and returned to their owner if possible. Feral animals must be transported to an approved humane shelter facility as specified by the base veterinarian. Pest management facilities must not be used as holding areas for animals.

3.5.12.6. Removal and disposal of dead animals is the responsibility of pest management unless contracted out. Personnel that handle dead or dying animals must wear proper personal protective equipment for handling and disposing of the carcasses.

3.5.12.7. Collection and disposal of dead animals will be tracked and reported to pest management, natural resources, and veterinary and public health personnel if dead animals harbor disease or parasites of medical importance to human or animal health. Public awareness of local disease presence must be coordinated with the installation public affairs office.

3.5.13. Security.

3.5.13.1. Comply with AFPMB TG No. 7, *Installation Pesticide Security*.

3.5.13.2. Coordinate with security forces when using firearms for pest management. Shotguns must be assigned by the logistics readiness squadron (LRS) for pest control.

3.5.13.2.1. Notify the security forces desk sergeant before engaging in pest management operations (including use of pellet rifles).

3.5.13.2.2. Wear blaze orange vest labeled ―Pest Management‖ when carrying a firearm on base.

3.5.13.2.3. Procure authorized ammunition through approved DOD and Air Force supply methods in accordance with AFCAT 21-209, Volume 1, *Ground Munitions*.

3.5.13.2.4. Properly store firearms and ammunition in accordance with AFI 31-101, *The Air Force Installation Security Program*.

3.5.14. Records.

3.5.14.1. Obtain necessary computer hardware and use the IPMIS pesticide software to track pesticide inventories and pesticide applicator certifications.

3.5.14.2. Record daily pesticide use on the IPMIS pesticide software or on DD Form 1532, *Pest Management Report*, and DD Form 1532-1, *Pest Management Maintenance Record*, if IPMIS is not online.

3.5.14.3. Ensure that pesticide recordkeeping complies with state or host nation requirements.

3.5.14.4. Keep historical data on termite inspection and pesticide application in accordance with the records disposition schedule (RDS).

3.5.15. Monthly reports (sent not later than 10 days after close of month to the local public health office and MAJCOM PMC [or ANG/A7AN]) shall include:

3.5.15.1. Pesticide inventory data.

3.5.15.2. Pesticide applicator certification data.

3.5.15.3. Pesticide application data (equivalent of Report Control Symbol [RCS]: DD-P&L [A&AR] 1080) for all pest management operations on Air Force real property:

3.5.15.3.1. Pest management shop.

3.5.15.3.2. Self-help pest management.

3.5.15.3.3. Grounds maintenance.

3.5.15.3.4. Golf course.

3.5.15.3.5. Contractors that apply pesticides.

3.5.15.3.6. Forestry.

3.5.15.3.7. Leasee and land permit holders.

3.5.16. Requesting Help from other Air Force Agencies.

3.5.16.1. Request assistance on airfield wildlife control problems, through the MAJCOM, from the BASH team at Headquarters Air Force Safety Center Flight Safety Wildlife **http://www.afsc.af.mil/organizations/bash/index.asp** (ANG personnel will request assistance from BASH personnel at ANG/A7AN). USDA Wildlife Services can also be contracted to assist with animal damage control.

3.5.16.2. Request help from 757 Airlift Squadron/Director Operations Spray (AS/DOS) **http://www.youngstown.afrc.af.mil/units/aerialspraysquadron/index.asp** for aerial dispersal of pesticides when ground-based pest management measures fail, are not practical, or are not feasible from a safety viewpoint. Contact the 757 AS/DOS entomologist, Youngstown Air Reserve Station, Ohio, when planning aerial pesticide dispersal operations.

3.6. Installation Natural Resources Manager/IPMC.

3.6.1. Provide program guidance for managing IPM programs in accordance with AFI 32-7064.

3.6.2. Work with MAJCOM and installation pest management personnel to develop relevant sections of the integrated natural resources management plan (INRMP) including

invasive species, animal damage control, BASH, ecosystem management, forestry, and range and grounds maintenance.

3.6.3. Coordinate all required National Environmental Policy Act (NEPA) documentation for pest management activities.

3.6.4. Provide guidance for threatened and endangered species protection.

3.6.5. Coordinate the INRMP and installation pest management plan with the U.S. Fish and Wildlife Service in accordance with the Sikes Act.

3.7. Public Health Officer.

3.7.1. Determine the type, source, and prevalence of disease vectors and other medically important pests which affect the health and efficiency of personnel in accordance with AFI 48-102, *Medical Entomology Program*.

3.7.2. Coordinate with CE pest management personnel on preventive measures for pests and monitor the effectiveness of CE pest management efforts.

3.7.3. Report to CE pest management personnel the value of food lost to pests and total hours pests of possible medical importance were surveyed so data can be submitted to the MAJCOM PMC in the monthly IPMIS report.

3.7.4. With the occupational and environmental working group, determine the scope of occupational physicals, requirement for immunizations, and provide a roster for scheduling occupational physical examinations, including baseline exams before pesticide exposure, for all CE and golf course personnel who apply pesticides.

3.7.5. Provide consultation on training and technical matters to pest management supervisors on the HAZCOM program. Supervisors will provide HAZCOM training to other pest management personnel.

3.8. Bioenvironmental Engineer.

3.8.1. Evaluate potential occupational exposures and the adequacy of exposure control through periodic shop visits.

3.8.2. Set local standards for obtaining and using personal protective equipment for pest management personnel.

3.8.3. Conduct respirator training and respirator fit testing of pest management personnel.

3.8.4. At the direction of the medical treatment facility commander, make sure medical treatment facilities personnel neither store nor use EPA-classified pesticides, with the exception of disinfectants and germicides; and insect repellents and permethrin-treated clothing for protecting deployed personnel against insect vectors.

3.9. Golf Course Manager and/or Superintendent.

3.9.1. Follow guidance in this instruction, AFI 32-7064, and DODI 4150.07.

3.9.2. Develop a golf course IPM plan for inclusion in the installation pest management plan.

3.9.3. Consult with the installation pest management supervisor and the MAJCOM PMC on pest management issues.

3.9.4. Request nonstandard pesticides for golf courses through the installation pest management coordinator and receive approval from the MAJCOM PMC before ordering or using nonstandard, locally purchased pesticides. **Note:** This requirement applies to use of government purchase cards (GPC) and all other forms of procurement.

3.9.5. The MAJCOM may waive DOD certification requirements for golf course personnel in CONUS (in accordance with DODI 4150.07) if the applicator is state certified in appropriate EPA categories. State certification must be maintained in accordance with state pesticide certification requirements.

3.10. Base Exchange Manager.

3.10.1. Maintain current pesticide inventory.

3.10.2. Only market pesticides with current EPA, state, and/or host nation registration.

3.10.3. Follow guidance in AFPMB TG No. 45, *Storage and Display of Retail Pesticides*, and AFPMB TG No. 15, *Pesticide Spill Prevention and Management.*

3.10.4. Coordinate all pesticide disposals with the installation pest management supervisor and follow that individual's guidance.

3.10.5. Make hardcopy MSDSs available for review by employees, the bioenvironmental engineer, and the fire department.

3.11. Defense Commissary Agency Manager.

3.11.1. Maintain current pesticide inventory.

3.11.2. Only market pesticides with current EPA, state, and/or host nation registration.

3.11.3. Follow guidance in AFPMB TG No. 45 and AFPMB TG No. 15.

3.11.4. Coordinate all pesticide disposals with the installation pest management supervisor and follows that individual's guidance.

3.11.5. Make hardcopy MSDSs available for review by employees, the bioenvironmental engineer, and the fire department.

4. Procedures.

4.1. Cooperating with Civilian Pest Management Projects.

4.1.1. When the Air Force and a civilian community have a common pest management problem, Air Force involvement should be proportionate to the military interest.

4.1.2. When pest management work, including aerial spray, is solely for the benefit of persons, communities, states, or other Federal agencies in the United States, a request from the appropriate Federal agency must go through DOD channels.

4.1.3. In overseas areas, give comparable assistance upon a request by the appropriate host nation authorities. Obtain Department of State approval per DOD Directive (DODD) 5100.46, *Foreign Disaster Relief*.

4.2. Identifying Pests.

4.2.1. If you need to identify insects, ticks, rodents, and other pests, contact one of the units listed in AFI 48-102 or another appropriate DOD or civilian agency.

4.2.2. In the United States, send specimens to USAFSAM/PHR (Attn: Entomology), 2513 Kennedy Circle, Brooks City-Base, TX 78235-5116.

4.2.3. Pacific Air Forces (PACAF) installations submit specimens to Det 3, USAF School of Aerospace Medicine (USAFSAM), Unit 5213, Box 10, Kadena AB, Japan (Okinawa), APO AP 96368-5213.

4.2.4. European (USAFE) installations submit specimens to HQ USAFE/A7AVQ, Unit 3050, Box 10, APO AE 09094-5010.

4.3. **Good Housekeeping Practices for Housing (Non-Privatized) and Facility Managers.** The installation pest management supervisor, facility managers, and building occupants cooperate on integrated pest management practices to keep pests under control without using pesticides. Such practices include:

4.3.1. Inspecting buildings.

4.3.2. Implementing proper sanitation.

4.3.3. Eliminating pest harborage.

4.3.4. Excluding pests.

4.3.5. Storing food properly.

4.3.6. Performing minor building maintenance.

4.3.7. Cooperating in scheduling work.

4.3.8. Arranging and protecting building contents before pest management jobs start.

4.3.9. Rearranging furnishings after pest management operations.

4.4. **Protective Clothing.** Protective clothing and equipment for personnel who mix and apply pesticide may include coveralls, respirators, goggles, or chemical- and oil-resistant rubber gloves, rubber boots, safety shoes, and special fumigation safety equipment. Use of protective equipment and the level of protection should comply with at least the minimum stated on the pesticide label.

4.4.1. Keep coveralls clean at all times. To prevent pesticide contamination of other clothing, use shop washing machines and dryers or clearly identify any clothing sent to base laundry services. Contaminated work clothing should never be taken home or cleaned in washing machines with other clothing.

4.4.2. Properly dispose of any clothing that is heavily contaminated by pesticides.

4.4.3. Pest management supervisors will keep the current copy of Air Force Office of Safety and Health Standard (AFOSH STD) 48-137, *Respiratory Protection Program*, in the shop and should be familiar with its contents.

4.5. Procuring and Disposing of Pesticides.

4.5.1. All installation pest management personnel shall obtain pesticides and equipment through Air Force supply channels, except as provided by service contracts.

4.5.1.1. Order standard pesticide application equipment from Federal supply catalogues.

4.5.1.2. Procure pesticides from AFPMB Standard Pesticides List or non-stock listed products that are approved by the MAJCOM PMC (or ANG/A7AN) and used in accordance with the pest management plan.

4.5.1.3. Request and receive approval from the MAJCOM PMC before ordering or using nonstandard, locally purchased pesticides or application equipment. **Note:** This requirement applies to use of GPCs and all other forms of procurement.

4.5.2. To ensure no one buys or issues non-approved pesticides, use advice code 2B on the ordering documents to inform supply personnel that another product may not be substituted for the requested item.

4.5.3. Pesticide applicators shall use all pesticides in accordance with EPA label directions. Reference EPA Endangered Species Protection Bulletins **http://epa.gov/espp/bulletins.htm** for geographically specific pesticide use limitations for the protection of endangered or threatened species and their designated critical habitat prior to purchase and use of pesticides.

4.5.4. The pest management supervisor, in coordination with the base environmental coordinator, will dispose of all pesticides or pesticide containers that have deteriorated or cannot be returned to depot stocks. The Defense Reutilization and Marketing Service will process excess stocks of pesticides for turn-in and disposal according to current environmental policy guidance.

4.6. Managing Pest Management Vehicles and Equipment.

4.6.1. Only pest management personnel may use pest management vehicles. Use equipment according to the manufacturer's instructions.

4.6.2. Equip vehicles with locking compartments to ensure the safe handling, storage, and transport of pesticides and other chemicals; a telephone maintenance truck (NSN 2320-00-541-1714) will suit the purpose. Low-speed vehicles used for pesticide application should be properly equipped for safety and operated in accordance with the manufacturer’s specifications.

4.6.3. Make sure that all prime movers used for fogging, misting, dusting, and ultra-low-volume application have enclosed cabs and internal recycling air-conditioners to protect the operator from excessive pesticide exposure. The appropriate level of respiratory protection and other personal protection equipment will be provided to the driver (in addition to rolling up the windows).

4.6.4. The truck must carry emergency phone numbers in case of spills or chemical exposures and carry a spill cleanup kit capable of containing 110 percent of the largest pesticide volume on the vehicle. Pest management personnel must carry radios or portable phones in vehicles.

4.6.5. Attach placards to vehicle- or trailer-mounted sprayers identifying the product name (brand name from product label) preceded by the word "Diluted" or "End-Use Concentrate"; EPA registration number from concentrate product label; name of active

ingredient(s) and percentage(s) of end-use dilution; and appropriate signal word, i.e., Poison, Danger, Warning, Caution (from product label).

4.6.6. Keep all pesticide dispersal equipment in the CE pest management section. **Exception:** Equipment at base golf courses that have certified pesticide applicators.

4.7. Contracting for Pest Management Services.

4.7.1. Use pest management contracts when more cost effective than in-house services. All pest management contractors must use IPM identified in the installation pest management plan and comply with the pesticide applicator certification, licensing, and registration requirements of the state or country where the work is performed.

4.7.2. The MAJCOM PMC (or ANG/A7AN) will review and approve all performance work statements. Installation personnel must receive MAJCOM PMC approval before a request (including GPCs and AF IMT 9, *Request for Purchase*) is made for procuring commercial pest management service (including base operations support [BOS], General Services Administration [GSA], subcontracts, or other support service contracts that utilize pesticides).

4.7.3. The CE contract management office will work with the installation contracting office to ensure all prospective contractors send proof that all their personnel have current state pesticide applicator certifications http://aec.army.mil/usaec/pest/certificates00.html for the types of operations specified in the contract statement of work prior to starting work.

4.7.4. The prospective contractor must operate in compliance with all state and local regulations. All pest management contractors must also comply with sections of DODI 4150.07 and contents of this instruction that apply to contract pest management operations. Only state-certified contract pesticide applicators may mix or apply pesticides on CONUS Air Force installations. For overseas installations outside U.S. jurisdiction, follow the country FGS or OBEGD for pest management contract requirements or MAJCOM policy.

4.7.5. The contracting officer and IPMC must approve the location where pesticides are mixed and/or stored prior to starting work. This site should have secondary containment and backflow prevention as identified in AFPMB TG No. 17. The contractor will ensure this area is properly managed to prevent spills.

4.7.6. The contractor must comply with all applicable parts of Title 29, Code of Federal Regulations (CFR), *Occupational Safety and Health Standards*, Part 1910; Title 29, CFR, *Safety and Health Standards for Federal Service Contracts*, Part 1925; Title 40, CFR, Parts 150-189, and Title 49, CFR, *Hazardous Materials Regulations*, Part 171, while on an Air Force installation, to ensure safe working conditions for contract personnel and a safe environment for the occupants of Air Force facilities.

4.7.7. Certified pest management shop personnel will help the QAE evaluate pest management contracts.

4.7.7.1. QAEs themselves must receive training in pest management according to guidance in DODI 4150.07. If an installation's total pest management contract efforts

are less than 0.25 work year annually, the presence of a trained QAE at the installation is not mandatory.

4.7.7.2. The contractor will furnish the QAE with labels and MSDSs for all contract pesticide materials 25 days prior to the start of the contract. The QAE will submit labels and MSDSs to the MAJCOM PMC for approval at least 15 days prior to the start of the contract. Any request during the contract period to use unapproved pesticides will be forwarded to the MAJCOM PMC for approval prior to use.

4.7.7.3. The contractor must provide data on daily pesticide use for input into the IPMIS pesticide management database. The contractor, QAE, or other CE representative will input data into IPMIS and forward it monthly (by 10 days after the close of the month) to the MAJCOM PMC, as specified in the contract.

4.7.7.4. The QAE or other CE representative must maintain historical pesticide data according to the RDS.

5. Technical Publications and Pest Management Websites.

5.1. **Publications.** Every pest management shop should have the following publications:

5.1.1. AFI 32-1074, *Aerial Application of Pesticides*

5.1.2. AFI 32-7064, *Integrated Natural Resources Management*.

5.1.3. AFI 48-102, *Medical Entomology Program*.

5.1.4. Armed Forces Pest Management Board publications: **http://www.afpmb.org/publications.htm**

5.1.5. UFGS 31 31 16, *Soil Treatment for Subterranean Termite Control*: **http://www.wbdg.org/ccb/DOD/UFGS/UFGS%2031%2031%2016.pdf**

5.1.6. Pest management trade journals.

5.1.7. State agricultural extension service pest management literature.

5.1.8. Pest management textbooks.

5.2. **Websites.** All Air Force pest management shops should have access to the following websites:

5.2.1. AFCESA Pest Management Program: **https://www.my.af.mil/gcss-af/USAF/ep/contentView.do?contentType=EDITORIAL&contentId=1299949&channelPageId=-336217&parentCategoryId=-1900281&programId=1242492**

5.2.2. 3E4X3 Communities of Practice (CoP): **https://wwwd.my.af.mil/afknprod/ASPs/CoP/EntryCoP.asp?Filter=OO-EN-CE-46**

5.2.3. Internet Center for Wildlife Damage Management: **http://icwdm.org**

5.2.4. Integrated Pest Management Information System (IPMIS): **http://www.envirosoftinc.com/ipmis.html**

5.2.5. DOD Forms: **http://www.dtic.mil/whs/directives/infomgt/forms/formsprogram.htm**

5.3. **Sources.** Contact your MAJCOM PMC or HQ AFCESA/CEOA for additional guidance. **Note:** ANG personnel should contact ANG/A7AN for additional guidance.

6. Prescribed and Adopted Forms.

6.1. Prescribed Forms.

None.

6.2. Adopted Forms.

AF Form 9, *Request for Purchase*

AF Form 847, *Recommendation for Change of Publication*

DD Form 1532, *Pest Management Report*

DD Form 1532-1, *Pest Management Maintenance Record*

DD Form 1826, *Certificate of Competency*

DD Form 1826-1, *Pesticide Applicator Card*

Loren M. Reno, Lt General, USAF
DCS/Installations, Logistics & Mission Support

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

7 USC 136 et seq., *Federal Insecticide, Fungicide, and Rodenticide Act* (FIFRA), as amended

7 USC 2801, *Federal Noxious Weed Act of 1976*

7 USC 426–426b, *Animal Damage Control Act*

16 USC 670, *Sikes Act*

16 USC 1531–1543, *Endangered Species Act of 1973*, as amended

29 CFR Part 1910, *Occupational Safety and Health Standards*

29 CFR Part 1925, *Safety and Health Standards for Federal Service Contracts*

40 CFR Parts 150–189, *Environmental Protection Agency*

49 CFR Part 171, *Hazardous Materials Regulations*

E.O. 13112, *Invasive Species*, February 3, 1999

AFCAT 21-209V1, *Ground Munitions*, 9 November 2007

AFI 31-101, *The Air Force Installation Security Program*, 1 March 2003

AFI 32-1074, *Aerial Application of Pesticides*, 1 May 1998

AFI 32-7045, *Environmental Compliance Assessment and Management Program (ECAMP)*, 1 July 1998

AFI 32-7064, *Integrated Natural Resources Management*, 17 September 2004

AFI 48-102, *Medical Entomology Program*, 1 July 2004

AFI 65-106, *Appropriated Fund Support of Morale, Welfare, and Recreation (MWR) and Non-appropriated Fund Instrumentalities (NAFIS)*, 6 May 2009

AFI 91-202, *The US Air Force Mishap Prevention Program*, 1 August 1998

AFJI 48-104, *Quarantine Regulations of the Armed Forces*, 24 January 1992

AFJI 48-131, *Veterinary Health Services*, 29 August 2006

AFMAN 33-363, *Management of Records*, 1 March 2008

AFOSH STD 48-137, *Respiratory Protection Program*, 10 February 2005

AFPAM 91-212, *Bird/Wildlife Aircraft Strike Hazard (BASH) Management Techniques*, 1 February 2004

AFPD 32-10, *Installations and Facilities*, 27 March 1995

AFPMB Standard Pesticides List

AFPMB TG No. 7, *Installation Pesticide Security*, August 2003

AFPMB TG No. 15, *Pesticide Spill Prevention and Management*, June 1992

AFPMB TG No. 17, *Design of Pest Management Facilities,* 1 November 1991

AFPMB TG No. 18, *Installation Pest Management Program Guide,* March 2003

AFPMB TG No. 24, *Contingency Pest Management Pocket Guide,* May 2008

AFPMB TG No. 37, *Guidelines for Reducing Feral/Stray Cat Populations on Military Installations in the United States,* January 1996

AFPMB TG No. 45, *Storage and Display of Retail Pesticides*, November 2006

DOD 4150.7-M, *DOD Pest Management Training and Certification* 24 April 1997

DOD 4150.07-M-V1, *DOD Plan for the Certification of Pesticide Applicators,* 12 December 2008

DOD 4715.05-G, *Overseas Environmental Baseline Guidance Document*, 1 May 2007

DODD 5100.46, *Foreign Disaster Relief*, 4 December 1975

DODI 4150.07, *DOD Pest Management Program,* 29 May 2008

DODI 6490.03, *Deployment Health*, 11 August 2006

EPA Endangered Species Protection Bulletins

EPA Guidelines for Responsible Pesticide Use, December 2005

UFGS 31 31 16, *Soil Treatment for Subterranean Termite Control*

Abbreviations and Acronyms

AF—Air Force **AFCAT**—

Air Force Catalog **AFI**—Air

Force Instruction

AFJI—Air Force Joint Instruction

AFMAN—Air Force Manual

AFOSH—Air Force Occupational Safety and Health

AFPAM—Air Force Pamphlet

AFPD—Air Force Policy Directive

AFPMB—Armed Forces Pest Management Board

ANG/A7AN—Air National Guard Civil Engineer Environmental Planning Division

ANG—Air National Guard

AOR—Area of Responsibility

AS/DOS—Airlift Squadron/Director Operations Spray

BASH—Bird/Wildlife Aircraft Strike Hazard **BOS**—

Base Operations Support

CE—Civil Engineering

CFR—Code of Federal Regulations

CONUS—Continental United States

CoP—Community of Practice

Det 3 HSC/OEA—Detachment 3 Human Systems Center Analytical Division

DODD—Department of Defense Directive

DOD—Department of Defense **DODI**—

Department of Defense Instruction

DOEHRS—Defense Occupational and Environmental Health Reporting System

DRU—Direct Reporting Unit

E.O.—Executive Order **EA**—

Environmental Assessment

ECAMP—Environmental Compliance Assessment and Management Program

EPA—Environmental Protection Agency

ESOHCAMP—Environmental, Safety, and Occupational Health Compliance Assessment Management Program

FGS—Final Governing Standards

FIFRA—Federal Insecticide, Fungicide, and Rodenticide Act

FOA—Field Operating Activity **GPC**—

Government Wide Purchase Card

GSA—General Services Administration

HAZCOM—Hazard Communication

HQ AFCEE—Air Force Center for Engineering and the Environment

HQ AFCESA—Air Force Civil Engineering Support Agency

HQ AFMSA/SG3PB—The Air Force Medical Support Agency Bioenvironmental Engineering Division

HQ AFMSA/SG3PM—The Air Force Medical Support Agency Public Health Division

HQ AFSC/SEFW—Headquarters Air Force Safety Center, Flight Safety, Wildlife

HQ USAF/A7C—The Office of the Civil Engineer, Headquarters United States Air Force

HQ USAFE/A7AVQ— Headquarters United States Air Forces Europe/Environmental Branch

HQ USAF—Headquarters United States Air Force

IMT—Information Management Tool **INRMP**—

Integrated Natural Resources Management Plan **IPMC**—

Installation Pest Management Coordinator

IPM—Integrated Pest Management

IPMIS—Integrated Pest Management Information System

LRS—Logistics Readiness Squadron

MAJCOM—Major Command **MoM**—

Measures of Merit **MSDS**—Material Safety

Data Sheet **NEPA**—National

Environmental Policy Act

NGB/A7—National Guard Bureau/Civil Engineer

NSN—National Stock Number **O&M**—

Operations and Maintenance **OCONUS**—Outside

Continental United States

OEBGD—Oversees Environmental Baseline Guidance Document

PACAF—Pacific Air Forces **PDO**—

Publication Distribution Office **PMC**—Pest

Management Consultant **PM**—Pest

Management

PMP—Pest Management Professional

QAE—Quality Assurance Evaluator

RDS—Records Disposition Schedule

SG—Surgeon General

SOFA—Status of Forces Agreement

TG—Technical Guide

UFGS—Unified Facilities Guide Specification

USACHPPM—United States Army Center for Health Promotion and Preventive Medicine

Terms

Armed Forces Pest Management Board (AFPMB)—A Directorate of the Office of the Deputy Under Secretary of Defense (Acquisition, Technology and Logistics), the AFPMB recommends DOD policy, provides scientific advice, and enhances coordination among DOD components on all matters related to pest management.

Direct Supervision—Supervision that includes being at the specific location where pest management work is conducted; providing instruction and control; and maintaining a line-of-sight view of the work performed. Certain circumstances may temporarily remove the line-of-sight view of the application of pesticide from the supervisor, such as topographic constraints, vegetation constraints, or building structural constraints. Under these temporary circumstances, the supervisor shall be responsible for the actions of the pesticide applicator.

Disease Vector—Any animal capable of transmitting the causative agent of a human disease; serving as an intermediate or reservoir host of a pathogenic organism; or producing human discomfort or injury, including (but not limited to) mosquitoes, flies, other insects, ticks, mites, snails, and rodents.

Installation Pest Management Coordinator (IPMC)—Installation pest management supervisor or natural resources manager for the installation that is designated by the installation civil engineer (in accordance with MAJCOM guidance) to serve as the IPMC with responsibility for developing and updating the installation pest management plan. The IPMC will also review installation pest management contracts and the monthly pesticide use (active ingredient) reports submitted to the MAJCOM PMC. Pesticide chemical requests will be provided to the IPMC for review to ensure compliance with hazardous materials management.

Integrated Natural Resources Management Plan (INRMP)—A plan based on ecosystem management that describes and delineates the interrelationships of the individual natural resources elements in concert with the mission and land use activities affecting the basic land management plans; defines the natural resources elements and the activities required to implement stated goals and objectives for those resources.

Integrated Pest Management (IPM)—A planned program incorporating continuous monitoring, education, record keeping, and communication to prevent pests and disease vectors from causing unacceptable damage to operations, people, property, materiel, or the environment. IPM includes methods such as habitat modification, biological control, genetic control, cultural methods, mechanical control, physical control, regulatory control, and the judicious use of least-hazardous pesticides.

Invasive Species—An alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health (E.O. 13112).

Noxious Weed—Any plant or plant product that can directly or indirectly injure or cause damage to crops (including nursery stock or plant products), livestock, poultry, or other interests of agriculture, irrigation, navigation, natural resources, the public health, or the environment.

Nuisance Wildlife—Wildlife that damages property, impedes installation operations, or endangers public health and safety to the point where control measures are required. This category excludes wildlife species protected by the Endangered Species Act or Migratory Bird Treaty Act. All wildlife control efforts should be conducted in accordance with AFI 32-7064 and appropriate regulatory authorities.

Pests—Arthropods, birds, rodents, nematodes, fungi, bacteria, viruses, algae, snails, marine borers, snakes, weeds, or other organisms (except for human or animal disease-causing organisms) that adversely affect readiness, military operations, or the well-being of personnel and animals; attack or damage real property, supplies, equipment, or vegetation; or are otherwise undesirable.

Pest Management Consultant (PMC)—Professional DOD pest management personnel located at component headquarters, field operating agencies, MAJCOMs, facilities engineering field divisions or activities, or area support activities, who provide technical and management guidance for the conduct of installation pest management operations. Some pest management consultants may be designated by their component as certifying officials.

Quality Assurance Evaluator (QAE)—A quality assurance inspector who is an Air Force employee, trained in pest management, who protects the government's interest through on-site performance evaluation of commercial pest management contracts or other contracts that involve the use of pesticides.

APPENDIX B

FINDING OF NO SIGNIFICANT IMPACT (FONSI) FOR ENVIRONMENTAL ASSESSMENT (EA) OF THE AERIAL APPLICATION OF PESTICIDE FOR MOSQUITO CONTROL AT HARB (JUL 2008)

FINDING OF NO SIGNIFICANT IMPACT

ENVI RONM ENTAL ASSESSM ENT OF AERIAL APPLICATION OF PESTICIDE FOR MOSQUITO CONTROL AT HOM ESTEAD ARB, FLORIDA

INTRODUCTION

Homestead Air Reserve Base (ARB) is in Miami-Dade County, located in the southeastern corner of Florida. Homestead ARB is headquarters for the 482nd Fighter Wing (482 FW). It is a fully combat-ready unit capable of providing F- I 6C m ultipurpose fighter aircraft, along with mission-ready pilots and support personnel, for short-notice worldwide deployment. As the host unit at Homestead ARB, the 482 FW maintains the installation facilities and provides all critical support functions to units at the installation. There are several military and governmental un its at Homestead ARB in addition to the 482 FW, including the 125th Fighter Wing, Detachment I of the Florida Air National Guard; the Special Operations Command South; the Maritime Safety and Security Team 91 I -I 4 of the U.S. Coast Guard; the Miami Aviation Branch of the U.S. Customs and Border Protection; and the Florida Army National Guard unit. The F- I 5 aircraft, flown by the Florida Air National Guard (FANG), are also based at Homestead ARB in addition to aircraft used by the U.S. Customs and Border Protection.

Surveillance results by the Miami-Dade County Public Works Department Mosquito Control Division and historical records indicate that mosquito species present at Homestead ARB, surrounding civilian neighborhoods, and agricultural tracts are capable of transmitting serious human diseases. Mosquito populations are large enough, at certain times, to cause h uman pain, discomfort, and stress. In extreme cases they may seriously affect the performance of outdoor work activities associated with the base's military mission, reduce recreational opportun ities, and decrease the overall morale and quality oflife within the infested area.

Under the Proposed Action, the U.S. Air Force (USAF) will conduct aerial adult mosquito control using EPA approved products labeled for such use on Homestead ARB property and adjacent areas of Miami-Dade County in order to create a buffer to mosquito activity. Applications would not exceed three treatments per season, except under emergency conditions, with all activities performed in coordination with the Miami-Dade County Public Works Department Mosquito Control Division. To enable implementation of this recommendation, the USA F proposes to provide the necessary specialized additional personnel and aircraft equipment to support the proposed action.

PURPOSE OF AN D NEED FOR THE PROPOSED ACTION

The purpose of the Proposed Action is to reduce mosquito populations by the careful application of chemical insecticides. The aerial dispersal of these materials, when done with care, has proven to be. an effective means to reduce mosquito populations of certain species, over a broad area. Large mosquito populations can cause human pain, discomfort, and stress. Aircraft maintenance personnel, in particular the 24-7 alert facility managed by the FANG, base security forces, fire department employees, and others who work outdoors on a regular basis may be adversely affected when the mosquito population is high. The overall effect of this decline can result in reduced personnel productivity, effectiveness, and responsiveness, and negative morale for assigned personnel, and nearby residents of the civilian comm unities.

DESCRIPTION OF THE PROPOSED ACTION

It is proposed to spray pesticides by aerial dispersal for adult mosquito control on approximately 2000 acres of Homestead ARB and up to between approximately 80,000 to 100,000 acres of Miami-Dade County. In practice, a subset of the entire potential acreage will be based on location and abundance of pest mosquitoes and be exclusive of acreage within both national parks.

Implementation of the Proposed Action will involve use of a treatment aircraft (C- l 30H Modular Aerial Spray System [MASS]) specially outfitted for aerial spray application, provided and staffed by trained and certified personnel from the US AFRC - Youngstown Air Reserve Station (ARS), Vienna, Ohio. The local base of operations would be at Homestead ARB, FL. Overflights of spray aircraft would be at an elevation of 100 to 300 feet. The spray operations would concentrate on periods of high mosquito activity for adult control measures. This is generally when mosq uito activity (biting/feeding) is greatest and weather conditions (wind and humidity) are most favorable for insecticide applications. Additionally, some applications may be conducted after dark.

Under the No Action Alternative, existing mosquito control measures taken by Homestead ARB and Miami-Dade County would remain unchanged. No aerial spray activities would be undertaken by AFRC aircraft temporarily assigned to Homestead ARB and mosquito populations would only be influenced by current control measures and natural forces.

SUMMARY OF ANTICIPATED ENVIRONMENTAL IMPACTS ASSOCIATED WITH THE PROPOSED ACTION

Based on the analyses accomplished as a part of the preparation of the Environmental Assessment (EA), the implementation of the Proposed Action would not result in significant direct or indirect impacts to environmental, physical, cultural, or socioeconomic resources. The use of best management practices and protective measures during their implementation minimizes their potential impact to the environment.

Potential cumulative impacts to regional air quality would be short term and insignificant. The anticipated low levels of emission from the Proposed Action and future projects would not occur at the same time; therefore, no cumulative issues associated with air emissions would apply. Given the limited and short-term nature of the project, no cumulative impacts to surface water or ground-water quality would be anticipated.

The Proposed Action would not result in significant cumulative effects to native wildlife species. All of the environmentally sensitive areas will be identified on the County's spray map and only sprayed if proper approval is obtained. Apiaries and sensitive individuals will be identified and public notifications will be carried out with the cooperation of the Miami-Dade County Mosquito Control Division prior to any aerial spraying.

PUBLIC REVIEW AND INTERAGENCY COORDINATION

The Draft EA was made available to the public for a 30-day review period, beginning 04 June 2008, and concluding 05 July 2008. No written comments were received during the public review period.

FINDING OF NO SIGNIFICANT IMPACT

After a review of the EA prepared in accordance with the requirements of the National Environmental Policy Act, the Council on Environmental Quality regulations, and the USAF's Environmental Impact Analysis Process (32 Code of Federal Regulations 989, as amended), and the completion of the public review period, l have determined that the Proposed Action will not have a significant impact on the quality of the human or natural environment and, therefore, an Environmental Impact Statement does not need to be prepared. This decision has been made after taking into account all submitted information and considering a full range of practical alternatives that would meet project requirements and that are within the legal authority of the USAF.

WILLIAM B. BINGER Colonel, USAFR
Commander, 482 FW

JUl 1 S 1008
Date

APPENDIX C

CURRENT LIST OF AND HOMESTEAD ARB AND DOD AUTHORIZED PESTICIDES

LIST OF CONTRACTOR PESTICIDES AND HERBICIDES

1. BIOMIST 30 + 30 ULV - Clarke Mosquito Control Products, Inc.
2. WASP-FREEZE – Whitmire Micro-Gen Research Laboratories, Inc.
3. CYNOFF – FMC Corporation
4. RODEO – Dow AgroSciences
5. QUEST
6. ROUNDUP PRO – Monsanto Company
7. FT TERMITICIDE – FMC Corporation
8. VIKANE – Dow AgroSciences

ARMED FORCES PEST MANAGEMENT BOARD (AFPMB) STANDARD PESTICIDES LIST AVAILABLE TO DOD COMPONENTS AND AGENCIES

October 1, 2013

This list contains pesticides that the Armed Forces Pest Management Board (AFPMB) has approved for DLA/DSCR stockage. DoD policy (DoD Instruction 4150.07) requires that the use of most of these pesticides whether procured from DLA or locally, must be pre-approved by a professional pest management consultant. This is usually done when the consultant approves the Installation's pest management plan. DoD policy also requires that only trained and certified applicators may apply pesticides on DoD installations. Only authorized personnel should procure and use these pesticides. Note: For Contingencies, see the Contingency Pesticide List and AFPMB Technical Guide 24. Changes on List are highlighted in bold red..

NSN 6840-	Item (Alternative Trade Name)	Unit Package	AAC *	Price	Unit Issue	Users+

Table of Contents

1. HERBICIDES/FUNGICIDES/ALGACIDES						
The following herbicides must be applied by a DoD certified pesticide applicator or under the direct supervision of a DoD Certified pesticide applicator.						
01-360-4741 MSDS Label	Fungicide, Methylisothiocyanate (MITC-FUME) ***RESTRICTED USE PESTICIDE***	18 tubes	J	**47.99**	CO	A, N, F, M
01-457-6588 MSDS Label	Fungicide, Methyl Azoxystrobin, 50% (Heritage)	(6) 1- lb. cont.	H	**6700.10**	BX	A, N, F, M
01-561-9603 MSDS Label	Herbicide, Aminopyralid, 40.6% (Milestone VM)	(2) 2.5-gal co	J	**2221.61**	BX	A, N, M, F
00-392-7593 MSDS Label	Herbicide, Bromacil, 21.9% lithium salt of bromacil, liquid (Hyvar X-L)	(4) 1-gal co	H	**517.02**	BX	A, F, M
01-408-9079 MSDS Label	Herbicide, Bromacil, 80%, wettable powder (Hyvar X)	(12) 4-lb bags	H	**2322.20**	BX	A, M
01-005-7523 MSDS Label	Herbicide, Diquat, 35.3%, water soluble liquid (Reward)	1-gal co	H	**487.40**	GL	F
00-815-2799 MSDS Label	Herbicide, Diquat, 35.3%, water soluble liquid (Reward)	(2) 2.5-gal co	H	**1074.96**	BX	A, N, F
01-341-9346 MSDS Label	Herbicide, Diuron, mínimum 80% diuron, granular	25-lb bag	H	**267.28**	BG	A, N, F, M
00-001-7710 MSDS Label	Herbicide, Diuron-Bromacil mixture, 40% bromacil, 40% diuron, granular (Krovar I DF)	6-lb bag	H	**132.40**	BG	A, N, F, M
01-356-6001 MSDS Label	Herbicide, Fluridone, 5%, pellets (Sonar SRP)	40-lb co	J	**660.12**	CO	A, N
01-356-8888 MSDS Label	Herbicide, Fluridone 41.7% liquid (Sonar A.S.)	1 qt co	H	**1196.38**	QT	A, N
01-525-5869 MSDS Label	Herbicide, Imazapic ammonium salt 23.6% liquid (Plateau)	(2) 1-gal co	J	**1458.00**	BX	A, N, M, F
01-108-9578 MSDS Label	Herbicide, Isopropylamine salt of glyphosate, 41%, water soluble liquid (Roundup Pro/Ranger Pro/Razor Pro/Glyfos Pro)	(2) 2.5-gal co	H	**193.72**	BX	A, N, F, M
01-388-0142 MSDS Label	Herbicide, Isopropylamine salt of glyphosate, 41%, water soluble liquid (Roundup Pro/Ranger Pro/Razor Pro/Glyfos Pro)	30-gal drum	H	**1210.76**	DR	A, F
01-356-8893	Herbicide, Isopropylamine salt of glyphosate, 53.8%, water soluble	(2) 2.5-gal co	H	**444.76**	BX	A, F, M

October 1, 2013

NSN 6840-	Item (Alternative Trade Name)	Unit Package	AAC *	Price	Unit Issue	Users+
MSDS Label	liquid (Rodeo/Aquamaster)					
01-377-7113 MSDS Label	Herbicide, Isopropylamine salt of glyphosate, 2.0%, water soluble liquid (Roundup Ready-to-Use)	24-oz pump spray bottle	H	9.20	BT	N, F
01-399-0673 MSDS Label	Herbicide, Ammonium salt of glyphosate, 73.3% and 2.9% Diquat dibromide, water soluble liquid (Quik Pro)	5 pkg.	H	23.47	BX	A,F, M
01-545-4540 MSDS Label	Herbicide, Ammonium salt of glyphosate, 73.3% and 2.9% Diquat dibromide, water soluble liquid (Quik Pro)	6.8 lb co	H	257.29	CO	A, N, M, F
01-356-8902 MSDS Label	Herbicide, Isopropylamine salt of imazapyr, **26.7% (Arsenal Powerline)**	(2) 2.5-gal co	H	2960.62	BX	A, N, F, M
01-532-5403 MSDS Label	Herbicide, Isopropylamine salt of imazapyr, 28.7% (Habitat)	(2) 2.5-gal co	H	2285.35	BX	A, N, F, M
01-318-7417 MSDS Label	Herbicide, Oryzalin, 40.4% (Surflan A.S.)	1-gal bot	H	407.27	GL	A, N, F, M
00-145-0013 MSDS Label	Herbicide, Prometon, 25% prometon, emulsifiable concentrate (Pramitol 25E)	(2) 2.5-gal co	H	313.01	BX	A, F
01-356-8891 MSDS Label	Herbicide, Methyl Sulfometuron, 75% (Oust XP)	48-oz co	H	656.46	CO	A, N, F, M
01-319-2890 MSDS Label	Herbicide, Tebuthiuron (Spike 80 DF)	4-lb bag	L	173.76	BG	A, N, F, M
01-457-6576 MSDS Label	Herbicide, Tebuthiuron-Diuron, 1% Tebuthiuron, 3% Diuron (Spraykil SK-13)	40 lb. container	H	234.13	CO	A, N, F, M
01-552-1822 MSDS Label	Herbicide, Triclopyr, 60.45% (Garlon 4 Ultra)	(2) 2.5-gal co	H	707.87	BX	A, N, M, F
00-577-4194 MSDS Label	Herbicide, 2,4-Dichlorophenoxy-acetic acid (2,4-D), oil miscible/water emulsifiable liquid (low volatile ester form)	(2) 2.5-gal co	H	205.40	BX	A, N, F, M
00-664-7060 MSDS Label	Herbicide, 2,4-Dichlorophenoxy-acetic acid (2,4-D), water soluble liquid (amine salt form)	(2) 2.5-gal co	H	147.65	BX	A, N, M
01-377-7110 MSDS Label	Herbicide, 2,4-Dichlorophenoxy-acetic acid (2,4-D), 0.128%, 0.22% MCPP and 0.05% Dicamba water soluble liquid (Weed-B-Gon MAX)	24-oz pump spray bottle	H	11.96	BT	F
2. REPELLENTS						
The following repellents must be applied by trained personnel or a DoD certified pesticide applicator.						
01-334-2666 MSDS Label	Insect Repellent, clothing application, 40% permethrin, liquid (2-Gal sprayer)	(12) 151-ml bot	H	154.97	BX	A, N, F, M
All DoD personnel following label and MSDS familiarization may apply the following repellents.						
01-284-3982 MSDS Label	Insect Repellent, personal application, Ultrathon (3M/EPA 58007-1)	(12) 2-oz tubes	H	98.52	BX	A, N, F, M
01-278-1336 MSDS Label	Insect Repellent, clothing application, aerosol (Permethrin Arthropod Repellent)	(12) 6-oz cans	H	82.00	BX	A, N, F, M
01-137-8456 MSDS Label	Insect Repellent, personal application, 3% benzocaine, 10% precipitated sulfur (Chigg-Away)	118-ml bot	H	6.70	BT	A, N, F, M
01-288-2188 MSDS Label	Insect Repellent, personal application & sunscreen, 20% DEET/SPF15 (Sunsect)	(12) 2-oz tubes	H	79.28	BX	A, N, F
01-452-9582 MSDS Label	Insect Repellent, personal application & sunscreen, 20% DEET/SPF15 (Sunsect)	320 packets	H	439.26	BX	A, N, F
01-493-7334 MSDS Label	Insect Repellent, personal application & camouflage face paint (CFP w/ DEET)	12 compacts/box	V	152.66	BX	A, N, F, M
01-345-0237 MSDS Label	Insect Repellent, clothing application, permethrin (IDA)	12 kits	H	60.86	BX	A, N, F, M
01-584-8393 MSDS Label	Insect Repellent, personal application, 30% DEET (SP532-Ultra30/LippoDEET)	(12)-2 oz tubes	H	75.71	BX	A, N, M, F
01-584-8598 MSDS Label	Insect Repellent, personal application, 23% DEET , pump spray bottles(Cutter Backwoods DEET Insect Repellent)	(12)-6 oz BT	H	77.94	BX	A, N, F, M
01-619-4795 MSDS Label	**Insect Repellent, personal application, 20% Picaridin, pump spray bottle (NATRAPEL Insect Repellent)**	**(12)-3.5 oz BT**	**Z**	**41.55**	**BX**	**A, N, M, F**

October 1, 2013

NSN 6840-	Item (Alternative Trade Name)	Unit Package	AAC *	Price	Unit Issue	Users+
01-602-8388	Insect Repellent, personal application & camouflage face paint (Stick w/ DEET), sand & loam colors	6 sticks/box	Y	37.40	BX	A, N, F, M
01-602-8387	Insect Repellent, personal application & camouflage face paint (Stick w/ DEET), green & sand colors	6 sticks/box	Y	37.40	BX	A, N, F, M
01-602-8370	Insect Repellent, personal application & camouflage face paint (Stick w/ DEET), black & green colors	6 sticks/box	Y	37.40	BX	A, N, F, M
01-602-8300	Insect Repellent, personal application & camouflage face paint (Stick w/ DEET), white & loam colors	6 sticks/box	Y	37.40	BX	A, N, F, M
01-602-8363	Insect Repellent, personal application & camouflage face paint (Stick w/ DEET), green & loam colors	6 stick/box	Y	37.40	BX	A, N, F, M
	3. INSECTICIDES					
	The following insecticides must be applied by a DoD certified pesticide applicator or under the direct supervision of a DoD Certified pesticide applicator.					
01-543-0662 MSDS Label	Insecticide, Abamectin, 0.011%, (Advance 360A Dual Choice Ant Bait Stations)	72 bait stations	H	86.42	BX	A, N, M, F
01-561-9766 MSDS Label	Insecticide, Abamectin, 0.05% (Avert Dry Flowable Cockroach Bait Formula 1)	12-30 gram tubes	H	391.01	BX	A, N, M, F
01-561-9649 MSDS Label	Insecticide, Abamectin, 0.05% (Avert Cockroach Bait Stations Formula 1)	4 bags. Each bag contains 72 bait stations	H	294.19	BX	A, N, F, M
00-145-0016 MSDS Label	Insecticide, Aluminum phosphide, 55 % tablets (Phostoxin/Fumitoxin) ***RESTRICTED USE PESTICIDE***	100 tablets	H	40.52	CN	A, N, F
00-442-5698 MSDS Label	Insecticide, Aluminum phosphide, 55 % pellets (Phostoxin/Fumitoxin) ***RESTRICTED USE PESTICIDE***	1660 pellets	H	73.38	BT	A, N, F, M
01-377-7049 MSDS Label	Insecticide, *Bacillus thuringiensis*, 10% (Summit BTI. Briquets)	100 Briquets	H	129.40	BX	A, N, F, M
01-565-8241 MSDS Label	Insecticide, *Bacillus thuringiensis(Vectobac WDG)*	24-1 lb bags/CO	H	1331.22	CO	A, N, M, F
01-287-3938 MSDS Label	Insecticide, Boric Acid, aerosol (Perma-Dust PT 249)	(12) 9 oz cans	V	117.55	BX	A, N, F, M
01-525-6888 MSDS Label	Insecticide, Bifenthrin, 7.9% liquid (**Talstar P Professional**)	1-qt co	H	66.25	QT	A, N, M, F
00-932-7297 MSDS Label	Insecticide, Carbaryl, 80%, water dispersible powder **(**Sevin 80S/AllPro Carbaryl 80S)	(5) 10-lb bags	Z	602.05	BX	A, N, F
01-104-0887 MSDS Label	Insecticide, Carbaryl, 43.4%, liquid (Carbaryl 4L)	(2) 2.5-gal co	H	403.82	BX	F
01-525-7139 MSDS Label	Insecticide, Chlorfenapyr, 21.45% liquid (Phantom)	(4) 75-oz co	H	1051.88	BX	A, N, F, M
01-313-7359 MSDS Label	Insecticide, beta-cyfluthrin, 11.8% (Tempo SC Ultra)	(12) 240-ml bot	H	627.41	BX	A, N, F, M
01-383-6251 MSDS Label	Insecticide, beta-cyfluthrin, 10% (Tempo Ultra WSP)	(32) 50 gm packs	H	449.59	BX	A, N, F, M
01-561-9717 MSDS Label	Insecticide, Cyfluthrin, 0.1%, aerosol (PT CY-KICK)	12 x 17.5 oz cans/box	H	164.87	BX	A, M, F, N
01-561-9669 MSDS Label	Insecticide, Lambda-cyhalothrin, 0.05% aerosol (PT 221L Residual)	12 x 17.5 oz cans/box	H	154.62	BX	A, M, N, F
01-390-4822 MSDS Label	Insecticide, Cypermethrin, 40% (Demon WP)	1-lb jar	H	82.29	LB	A, N, F, M
01-573-5024 MSDS Label	Insecticide, Deltamethrin, 0.03% (Kills Bedbugs II)	(4) 1- gal jugs	Z	98.68	BX	A,N,F, M
01-431-3345	Insecticide, Deltamethrin, 0.05% (Delta Dust)	1-lb co	H	16.30	LB	A, N, F,

ARMED FORCES PEST MANAGEMENT BOARD (AFPMB) STANDARD PESTICIDES LIST AVAILABLE TO DOD COMPONENTS AND AGENCIES

October 1, 2013

NSN 6840-	Item (Alternative Trade Name)	Unit Package	AAC *	Price	Unit Issue	Users+
MSDS Label						M
01-561-9745 MSDS Label	Insecticide, Deltamethrin, 0.06%, aerosol (D-Force Residual)	8 x 14 oz cans/box	H	**143.00**	BX	A, N, M, F
00-142-9438 MSDS Label	Insecticide, Dichlorvos, 20% (plastic strips)	48 strips	V	**229.91**	BX	A, N, F, M
01-603-5650 MSDS Label	Insecticide, Dichlorvos, 20% (NUVAN PROSTRIPS + 65 Gram)	6 packs per box (3 strips per pack)	Z	**438.12**	BX	A, N, M, F
01-603-5654 MSDS Label	Insecticide, Dichlorvos, 20% (NUVAN PROSTRIPS 16 Gram)	6 packs per box (12 strips per pack)	J	**519.38**	BX	A, N, M, F
01-412-4634 MSDS Label	Insecticide, D-Phenothrin, 2%, aerosol	12-oz can	H	**16.79**	CN	A, N, F, M
66-131-2263	**Insecticide, D-Phenothrin 2% and Permethrin 2% (Callington 1-Shot Aircraft Insecticide) ***TEMPORARY USE PESTICIDE*** For use in Disinsection of Aircraft Cargo Holds**	**150 gram can**	**D**	**16.00**	**CN**	**N, F**
01-586-8718 MSDS Label	Insecticide, Allethrin-Permethrin Mixture 0.25% and 0.15% , aerosol (Ace House & Garden Bug Killer 2)	15-oz can	D	**7.60**	CN	A, N, M, F
01-067-2137 MSDS Label	Insecticide, D-trans Allethrin and Resmethrin, 0.125% and 0.2% , aerosol (Kill Zone House & Garden Insect Killer Formula 4)	14-oz can	V	**3.68**	CN	A, N, F, M
01-573-4964 MSDS Label	Insecticide, Etofenprox, 20% (Zenivex E20)	(2) 2.5-gal co	H	**2837.12**	BX	A,N,M
01-619-6396 MSDS Label	**Insecticide, Etofenprox 1.0%; Tetramethrin 0.5% and Piperonyl Butoxide 1.5% (ZENPROX Aerosol)**	**(6) 16-oz cans**	**Z**	**51.04**	**BX**	**A,N,F, M**
01-183-7244 MSDS Label	Insecticide, Methomyl, 1.1%, Fly bait (Golden Malrin/Stimukil)	5-lb can	H	**21.50**	CN	A, N, F, M
01-287-3913 MSDS Label	Insecticide, Hydramethylnon (Amdro Fire Ant Bait; **PROBAIT Fire Ant Bait)**	(24) 6-oz bot	H	**606.83**	BX	A, N, F, M
01-501-2905 MSDS Label	Insecticide, Hydroprene, 90.6% (Gentrol Point Source)	20 devices/box	H	**51.25**	BX	A, M, N
01-585-9976 MSDS Label	Insecticide, Hydroprene, 0.36%(Gentrol Aerosol)	(12) 16 –oz cans	H	**157.89**	BX	A, N, M F
01-424-2494 MSDS Label	Insecticide, Fenoxycarb (Award Brand of Logic)	25-lb bag	H	**441.90**	BG	A, N, F, M
01-585-9950 MSDS Label	Insecticide, Fipronil, 0.0143% (Top Choice Fire Ant Granules) ***RESTRICTED USE PESTICIDE***	50-lb bag	H	**358.80**	BG	A, N, M, F
01-224-1269 MSDS Label	Insecticide, Fipronil, cockroach, large size (Combat Source Kill Max R2)	8 bait stations/ box/ 12 boxes	H	**168.90**	PG	A, N, F, M
01-180-0167 MSDS Label	Insecticide, Fipronil, cockroach, regular size (Combat Source Kill Max R1)	12 bait stations/ box/ 12 boxes	H	**150.95**	PG	A, N, F, M
01-483-3065 MSDS Label	Insecticide, Fipronil (Maxforce FC Roach Killer Bait Gel)	24-60 gram reservoirs/ box	H	**345.80**	BX	A, N, M
01-471-5650 MSDS Label	Insecticide, Fipronil (Maxforce FC Roach Killer Bait Gel)	4-30 gram reservoirs/box	H	**28.38**	BX	A, N, M
01-500-4579 MSDS Label	Insecticide, Fipronil (Maxforce FC Ant Killer Bait Gel)	4 reservoirs/box	H	**33.36**	BX	A, N, M, F
01-602-8269 MSDS Label	Insecticide, Fipronil (Maxforce FC Magnum Roach Killer Bait Gel)	12-33 gram reservoirs per box	H	**170.16**	BX	A, N, M, F
01-298-1122 MSDS Label	Insecticide, Fipronil (MaxForce FC Ant Bait)	96 stations	H	**122.35**	PG	A, N, F, M
01-483-3072 MSDS Label	Insecticide, Fipronil (Termidor 80WG)	24 co/box	H	**3980.84**	BX	A, N, M
01-483-3068 MSDS Label	Insecticide, Fipronil (Termidor SC)	4-78 oz BT/box	H	**1318.63**	BX	A, N, M
01-318-7416 MSDS Label	Insecticide, Hydroprene, 9.0%, emulsifiable concentrate (Gentrol IGR)	(10) 1-oz bot	H	**81.14**	BX	A, N, F, M
01-591-2150 MSDS Label	Insecticide, Imidacloprid (Temprid SC)	400 ml CO	H	**147.90**	CO	A,N, F, M

ARMED FORCES PEST MANAGEMENT BOARD (AFPMB) STANDARD PESTICIDES LIST AVAILABLE TO DOD COMPONENTS AND AGENCIES

October 1, 2013

NSN 6840-	Item (Alternative Trade Name)	Unit Package	AAC *	Price	Unit Issue	Users+
01-518-5807 MSDS Label	Insecticide, Imidacloprid (Maxforce Granular Fly Bait)	5 lb co	H	**50.53**	CO	A, N, F, M
01-555-9369 MSDS Label	Insecticide, Imidacloprid (Maxforce Fly Spot Bait)	(50) 2 oz pkg/box	H	**396.97**	BX	A, N, M, F
01-457-6580 MSDS Label	Insecticide, Imidacloprid, 0.5% granular (Merit 0.5 g)	30 lb. bag	H	**228.86**	BG	A, N, F, M
01-428-6646 MSDS Label	Insecticide, Lambda-cyhalothrin, 9.7% (Demand CS)	(8) 8 oz bottle	H	**487.40**	BX	A, N, F, M
01-431-3357 MSDS Label	Insecticide, Lambda-cyhalothrin (Surrender Pesttab)	40 tablets	H	**72.73**	CO	A, N, F, M
00-655-9222 MSDS Label	Insecticide, Malathion, 57.0%, emulsifiable concentrate, class 2	1-gal co	H	**64.27**	GL	A, N, F, M
00-685-5438 MSDS Label	Insecticide, Malathion, 57.0%, emulsifiable concentrate, class 2	5-gal can	H	**290.53**	CN	A, N, F, M
00-926-1481 MSDS Label	Insecticide, Malathion, 96.5%, liquid, (Fyfanon ULV)	54-gal drum	H	**4018.39**	DR	A, N, F, M
01-169-1842 MSDS Label	Insecticide, Malathion, 96.5%, liquid, (Fyfanon ULV)	5-gal can	H	**350.50**	CN	A, N, F, M
01-424-2495 MSDS Label	Insecticide, Methoprene (Altosid XR Briquets)	220 Briquettes	H	**1179.56**	BX	A, N, F, M
01-511-0535 MSDS Label	Insecticide, Methoprene (Altosid Pellets)	(2) 22 lb co/box	H	**2182.38**	BX	A, N, F, M
01-424-2493 MSDS Label	Insecticide, Methoprene (Altosid Liquid Larvicide Conc.)	(2) 2.5-gal co	H	**9250.68**	BX	A, N, F, M
01-591-2155 MSDS Label	Insecticide, Methoprene (Precor 2000 Plus)	12 aerosols/box	H	**222.49**	BX	A, N, M, F
01-270-9765 MSDS Label	Insecticide, Naled, 87.4, liquid (Dibrom)	30-gal drum	H	**7613.95**	DR	A, F
01-532-5414 MSDS Label	Insecticide, Naled, 78%, liquid (Trumpet EC)	30-gal drum	J	**5475.14**	DR	A, N, F, M
00-597-6111 MSDS Label	Insecticide, Naphthalene, ball form	14-oz box	H	**7.25**	BX	A, N, F, M
01-467-0994 MSDS Label	Insecticide, Nithiazine, Fly Strips (Quikstrike), 2 strips per package	(12) PG/box	H	**262.60**	BX	A, N, F
00-174-1825 MSDS Label	Insecticide, P-Dichlorobenzene, crystal/flake	100-lb drum	J	**390.00**	DR	A, N, F
00-174-1824 MSDS Label	Insecticide, P-Dichlorobenzene, crystal **GSA**	1-lb can	J	17.04	LB	N, F, M
01-606-8581 MSDS Label	Insecticide, Permethrin-Piperonyl Butoxide (20.6+ 20.6%), All Pro Aqualuer 20-20	(2)-2.5 gal co/box	J	**1313.26**	BX	A, N, F, M
01-550-5660 MSDS Label	Insecticide, Permethrin-Piperonyl Butoxide (4.6+4.6%) , (Kontrol 4-4)	(2) 2.5-gal co	H	**333.40**	BX	A, N, F, M
01-104-0780 MSDS Label	Insecticide, Pyrethrins, 3% pyrethrins with synergists, liquid (ULV fog concentrate)	1-gal bot	H	**222.08**	GL	A, N, F, M
00-459-2443 MSDS Label	Insecticide, Phenothrin 0.120% and Allethrin 0.129%, aerosol (Wasp-Freeze Wasp & Hornet Killer)	(12) 17.5-oz cans	H	**114.36**	BX	A, N, F, M
01-619-6467 MSDS Label	**Insecticide, Etofenprox 0.50%; Tetramethrin 0.2% and Piperonyl Butoxide 1.0% (Zoecon Wasp-X Wasp and Hornet Spray)**	**(12) 16-oz cans**	**Z**	**74.01**	**BX**	**A, N, F, M**
00-823-7849 MSDS Label	Insecticide, Pyrethrin, aerosol (PT 565 Plus XLO)	(12) 20-oz cans	H	**241.14**	BX	A, N, F
01-359-8533 MSDS Label	Insecticide, Resmethrin (Scourge) *****RESTRICTED USE PESTICIDE*****	5-gal can	H	**757.18**	CN	A, N, F
01-457-6583 MSDS Label	Insecticide, Spinosad, 11.6% (Conserve SC)	1 qt co	H	**218.54**	QT	A, N, F, M
01-474-7751 MSDS Label	Insecticide, Sumithrin-Piperonyl Butoxide, 10%-10%, (Anvil 10+10 ULV)	(2) 2.5-gal/box	H	**2334.52**	BX	A, M, F, N
01-474-7706 MSDS Label	Insecticide, Sumithrin-Piperonyl Butoxide, 10%-10%, (Anvil 10+10 ULV)	250 gal co	J	----------	CO	A, N, F, M
01-424-3132 MSDS Label	Insecticide, Temephos (Abate 4E**;** ALLPRO Provect 4E Larvicide)	2.5-gal co	H	**1567.16**	CO	A, N, F, M
01-498-9270 MSDS Label	Insecticide, Temephos (5% Skeeter Abate; ALLPRO Provect 5G Larvicide)	2-22 lb co	H	**282.18**	EA	A, F

October 1, 2013

NSN 6840-	Item (Alternative Trade Name)	Unit Package	AAC *	Price	Unit Issue	Users+
01-467-1029 MSDS Label	Mosquito Larvicide and Pupicide (Agnique MMF)	(2) 2.5-gal co	Y	347.62	BX	A, N, F

4. EPA 25 (b) EXEMPT PESTICIDE PRODUCTS						
The following are EPA 25(b) exempt pesticides that have been approved by the AFPMB for stock listing.						
01-606-9951 MSDS Label	Insecticide, Geraniol, 1.3%; aerosol (Terminix Natural Pest Control Flying Insect Killer)	(6) 14 oz cans	J	51.94	BX	A, N, F, M
01-607-0000 MSDS Label	Insecticide, Thyme Oil, 4.1%; (TyraTech Tech Dust Natural Insecticide)	10 lb. pail	J	88.29	CO	A, N, F, M

5. RODENTICIDES						
The following rodenticides must be applied by trained personnel or a DoD certified pesticide applicator.						
00-089-4664 MSDS Label	Rodenticidal Bait, Anticoagulant, 0.005% Diphacinone	40 blocks	H	112.92	BX	A, N, F, M
01-577-2202 MSDS Label	Rodenticide, Anticoagulant, (Kaput Combo Bait Pellets), 0.020% Imidacloprid and 0.025% Warfarin	250 packets/bx	H	113.31	BX	A, N, F, M
01-598-2617 MSDS Label	Rodenticidal Bait, Anticoagulant, 0.005% Bromadiolone (Maki), pellets	175 pkgs/CO	H	153.37	CO	A, N, M. F
01-598-4840 MSDS Label	Rodenticidal Bait, Anticoagulant, 0.005% Brodifacoum (Talon-G), pellets	2 pails each w/150 pkgs per box	H	137.12	BX	A, N, M, F
01-501-2858 MSDS Label	Rodenticidal Bait, Anticoagulant, 0.005% Bromadiolone, (Contrac Blox), 1 oz bait blocks	18-lb co	H	91.92	CO	A, N, M, F
01-503-5348 MSDS Label	Rodenticidal Bait, Anticoagulant, 0.005% Brodifacoum, (Final Blox), 20 gram bait blocks	18-lb co	H	100.79	CO	A, M, N, F
00-753-4972 MSDS Label	Rodenticide, Anticoagulant, concentrate 0.106% sodium salt of diphacinone (LIQUA-TOXII)	50 pouches	H	88.57	BX	A, N, F, M
01-598-4844 MSDS Label	Rodenticide, Anticoagulant, concentrate 0.106% sodium salt of diphacinone (LIQUA-TOXII)	4 packages per box (8 packets per package)	H	98.78	PG	A, N, M, F
01-435-9318 MSDS Label	Rodenticide, 10% zinc phosphide (ZP Tracking Powder) ***RESTRICTED USE PESTICIDE***	(4) 500-g bot	H	47.48	BX	N, F
01-619-6419 MSDS Label	**Rodenticide, Anticoagulant, Difethialone 0.0025% (First Strike Soft Bait Rodenticide)**	**16 lb. co**	**Z**	**103.88**	**CO**	**A, N,M, F**

6. SURFACTANTS						
Surfactants are not pesticides, but are wetting agents that lower the surface tension, allowing easier spreading, and lower the interfacial tension between two liquids. Some pesticides, particularly herbicides, either require the use of a surfactant or performance may be improved by the addition of a surfactant. Refer to the pesticide label to determine if a surfactant is recommended by manufacturer.						
01-546-3053 MSDS Label	Surfactant, Pesticide, Spray Adjuvant (Cygnet Plus)	(2) 2.5-gal co	J	196.44	BX	A, N, M, F
01-356-8896 MSDS Label	Surfactant, Pesticide, Spray Adjuvant (Cide-Kick II)	(2) 2.5-gal co	H	256.91	BX	A, N, M, F
01-356-8897 MSDS Label	Surfactant, Pesticide, Spray Adjuvant (Cide-Kick)	(2) 2.5-gal co	H	238.15	BX	A, N, M, F

ARMED FORCES PEST MANAGEMENT BOARD (AFPMB) STANDARD PESTICIDES LIST AVAILABLE TO DOD COMPONENTS AND AGENCIES

October 1, 2013

NSN 6840-	Item (Alternative Trade Name)	Unit Package	AAC *	Price	Unit Issue	Users+

+User Code A=Army, N=Navy, F=Air Force, M=Marines SOS (DSCR-Richmond/DLA Aviation) =SMS

***ACQUISITION ADVICE CODES (AAC)**

D. DOD INTEGRATED MATERIAL MANAGER (IMM) STOCKED, AND ISSUED. Issue, transfer, or shipment is not subject to specialized controls other than those imposed by the Integrated Material Manager/Military Service supply policy.
   1. The item is centrally managed, stocked, and issued.
   2. Requisitions will be submitted in accordance with Military Service requisitioning procedures.

G. GENERAL SERVICES ADMINISTRATION (GSA) INTEGRATED MATERIAL MANAGED, STOCKED AND ISSUED. Identifies GSA managed items available from GSA Supply Distribution Facilities. Requisitions and fund citations will be submitted in accordance with GSA/Military Service requisitioning procedures.

H. CENTRAL CONTRACT - NOT STOCKED ITEM. Direct delivery under central contract # (non-stocked items) issue, transfer, or shipment is not subject to specialized controls other than those imposed by IMM/Service/Agency supply policy.
   1. The item is centrally managed and procured.
   2. Normal issue is by direct shipment from the vendor to the user at the order of the ICP or IMM. However, orders for quantities less than the vendor's minimum order of quantity may be issued from stock by ICP or IMM supply distribution facilities.
   3. Requisitions and fund citations will be submitted in accordance with IMM/Service/Agency requisitioning procedures.
   4. Generally, delivery will be made within applicable Service/Agency guidelines addressing customer-required time frame.

I. DIRECT ORDERING FROM A CENTRAL CONTRACT/SCHEDULE. Issue, transfer, or shipment is not subject to specialized controls other than those imposed by Integrated Material Manager/Military Service supply policy. The item is covered by a centrally issued contractual document, or by a multiple award Federal Supply schedule for GSA managed items, which permits using activities to place orders on vendors for direct delivery to the user.

J. NOT STOCKED, CONTROLLED PROCURED. Identifies IMM/Military Service centrally managed but not stocked items. Long lead times must be anticipated, since procurement will be initiated only after receipt of a requisition. Requisitions will be submitted in accordance with IMM/Military Service requisitioning procedures.

K. CENTRALLY STOCKED FOR OVERSEAS ONLY. Main means of supply is local purchase. Item is stocked in domestic supply system for those overseas activities unable to procure locally due to non-availability of procurement sources or where local purchase is prohibited. Requisitions will be submitted by overseas activities in accordance with Service/Agency requisitioning procedures. NOTE: CONUS activities will obtain supply support through local procurement procedures.

L. LOCAL PURCHASE. IMM/Military Service managed items authorized for local purchase, as a normal means of support, by the Military Service, or base, post, camp, or station level. Items not stocked in wholesale distribution system of IMM/Military Service ICP. The local purchase forms authorized by the individual IMM/Military Service must be used. NOTE: GSA FSS items are included.

V. TERMINAL ITEM. Identifies items in stock; but future procurement is not authorized. Requisitions may continue to be submitted until stocks are exhausted. Preferred items National Stock Number (NSN) normally provided by the application of the phrase, "When Exhausted Use (NSN)". Requisitions will be submitted in accordance with IMM/Military Service requisitioning procedures as applicable.

X. SEMIACTIVE ITEM-NO REPLACEMENT. A potentially inactive NSN which must be retained in the supply system as an item of supply because (1) stocks of the item are on hand or in use below the wholesale level and (2) the NSN is cited in equipment authorization documents TO&E, TA, TM, etc. or in-use assets are being reported.
   1. Items are authorized for central procurement but not authorized for stockage at wholesale level.
   2. Requisitions for in-use replacement will be authorized in accordance with individual Military Service directives.
   3. Requisitions may be submitted as requirements generate. Repetitive demands may dictate at ACC change to permit Wholesale stockage.

Y. TERMINAL ITEM. Further identifies AAC V items on which wholesale stocks have been exhausted. Future procurement not authorized.
   1. Requisitions will not be processed to the wholesale suppliers.
   2. Internal Services' requisitioning may be continued in accordance with Military Service requisitioning policies.

Z. INSURANCE/NUMERIC STOCKAGE OBJECTIVE ITEM. Items, which may be required occasionally or intermittently and prudence requires that a nominal quantity of material be stocked due to the essentiality or the lead-time of the item.
   1. The item is centrally managed, stocked and issued.
   2. Requisitions will be submitted in accordance with IMM/Military Service requisitioning procedures.

DLA/DSCR POC:

CLIFFORD MYERS

APPENDIX D

REQUEST FOR APPROVAL OF NEW PESTICIDE FORM (EXAMPLE)

REQUEST FOR APPROVAL OF NON-STANDARD PESTICIDE

MAJCOM:		**INSTALLATION:**	
POINT OF CONTACT:		**ACTIVITY:**	
OFFICE SYMBOL:			
DSN:			
Commercial:			
E-MAIL:			
POC SIGNATURE			
DATE SIGNED			

PESTICIDE INFORMATION

TRADE NAME:		**EPA#**	
ACTIVE INGREDIENT:		**SIGNAL WORD:**	
FORMULATION:		**CONTAINER SIZE:**	
QUANTITY REQUESTED:		**NSN:**	

TARGET PEST

SPECIES:	

JUSTIFICATION STATEMENT (Provide details as to need):

APPLICATOR INFORMATION

NAME:	**DOD/STATE CERTIFICATION NUMBER**

MAJCOM PEST MANAGEMENT CONSULTANT APPROVAL

APPROVED w/conditions: (one time only, used by date, or indefinitely)	**NOT APPROVED** (Justification)

MAJCOM CONSULTANT SIGNATURE	**DATE SIGNED**

Please complete and e-mail to:

Continuation:

APPENDIX E

PESTICIDE APPLICATION LOG (EXAMPLE)

Country	Afghanistan
POC/Unit:	Jeffrey Cook, DynCorp International

Example of Pesticides Applied

Type in the date that the pesticide was applied. The preferred format is YYYY-MM-DD (i.e. 2012-10-25).	The name of the country where the pesticide was applied should automatically populate based on the selection made in cell B2 above.	Type in the current name of the base camp where the pesticide was applied.	Select the specific site of application from the drop down list where the pesticide was applied (i.e. bldg #, activity name, etc.) . If the site is not listed, please type in the site of application.	Select the origin for why the pesticide was applied from the drop down list (i.e. work order, etc.).	Select the type of operation performed from the drop down list (i.e. Exterior Bait).	Select a target pest that you were attempting to manage/control from the drop down list (i.e. Rodents). If the target pest isn't listed, then write the target pest in the additional comments field.	Type in the size of the area treated (i.e. 100).	Select the appropriate units of measure (i.e. square feet, meters, acres, etc.) related to the area treated from the drop down list.	Select the Environmental Protection Agency Registration Number (EPA Reg. No. on product label) of the pesticide applied from the drop down list (i.e. 12455-79). If the number doesn't appear, please go to the worksheet called "New Pesticides Applied" to manually enter the EPA Registration Number.	If the EPA Registration Number is selected, the pesticide trade name will automatically populate in this column (i.e. CONTRAC All-Weather Blox).	If the EPA Registration Number is selected, the product formulation will automatically populate in this column (i.e. Pelleted/Tabletted).
Date	**Country**	**Base Camp**	**Site of Application**	**Origin**	**Operation**	**Target Pest**	**Area Treated**	**Units of Measure for the Area Treated**	**EPA Registration Number**	**Pesticide Trade Name**	**Product Formulation**
2012-10-15	Afghanistan	Bagram	Post Exchange (PX)	Work Order	Exterior Bait	Rodents	780	linear feet	12455-79	CONTRAC All-Weather Blo	Pelleted/Tabletted
2012-10-15	Afghanistan	Bagram	Barracks	Service or Trouble Call	Interior Residual Treatment	Bed Bugs	1000	square feet	432-1363	TEMPO SC ULTRA	Soluble Concentrate
2012-10-15	Afghanistan	Bagram	Dining Facility (DFAC)	Scheduled Work	Exterior Bait	Rodents	200	linear feet	12455-89	FINAL All-Weather Blox	Pelleted/Tabletted
2012-10-16	Afghanistan	Bagram	Hangar B, Building 56	Service or Trouble Call	Ultra Low Volume Application	Gnats	12,000	cubic feet	499-450	PT ULD BP-300 Contact In	ULV Concentrate
2012-10-16	Afghanistan	Bagram	Building 107, COMM Center	Scheduled Work	Interior Bait	Ants	200	square feet	432-1252	Maxforce Ant Bait Station	Impregnated Material
2012-10-17	Afghanistan	Bagram	Zone 18, Building 101	Work Order	Exterior Residual Or Spot Treatment	Wasps	10	square feet	499-362	PT Wasp-Freeze Wasp &	Aerosol
2012-10-17	Afghanistan	Bagram	Building 57, Latrines	Scheduled Work	Exterior Bait	Filth Flies	700	square feet	432-1375	Maxforce Granular Fly Bai	Granular
2012-10-17	Afghanistan	Bagram	Ammunition Bunker	Work Order	Sprayed By Hand	Weeds	1	acre	524-475	Roundup Pro Herbicide	Soluble Concentrate

Example of New Pesticides Applied

Type in the date that the pesticide was applied. The preferred format is YYYY-MM-DD (i.e. 2012-10-25).	The name of the country where the pesticide was applied should automatically populate based on the selection made in cell B2 above.	Type in the current name of the base camp where the pesticide was applied.	Select the specific site of application from the drop down list where the pesticide was applied (i.e. bldg #, activity name, etc.) . If the site is not listed, please type in the site of application.	Select the origin for why the pesticide was applied from the drop down list (i.e. work order, etc.).	Select the type of operation performed from the drop down list (i.e. Exterior Bait).	Select a target pest that you were attempting to manage/control from the drop down list (i.e. Rodents). If the target pest isn't listed, then write the target pest in the additional comments field.	Type in the size of the area treated (i.e. 100).	Select the appropriate units of measure (i.e. square feet, meters, acres, etc.) related to the area treated from the drop down list.	Type in the Environmental Protection Agency Registration Number (EPA Reg. No. on product label) of the pesticide applied (i.e. 12455-79).	Type in the pesticide trade name (i.e. CONTRAC All-Weather Blox).	Type in the product formulation (i.e. Pelleted/Tabletted).
Date	**Country**	**Base Camp**	**Site of Application**	**Origin**	**Operation**	**Target Pest**	**Area Treated**	**Units of Measure for the Area Treated**	**EPA Registration Number**	**Pesticide Trade Name**	**Product Formulation**
2012-10-17	Afghanistan	Bagram	Dining Facility (DFAC)	Service or Trouble Call	Interior Bait	Cockroaches	100	linear feet	352-668	DuPont Advion Cockroach	Bait Station

Example of Surveillance, Non-Chemical, and Animal Control

Type in the date that the pesticide was applied. The preferred format is YYYY-MM-DD (i.e. 2012-10-25).	The name of the country should automatically populated based on the selection made in cell B2 above.	Type in the current name of the base camp for this surveillance/nonchemical action.	Select the site of application from the drop down list. If the site of application is not listed, then type in the site of application. The site of application is the specific location (i.e. bldg #, activity name, etc.) for this action.	Please select the origin from the drop down list. An origin is why you did the work: routine inspection, work request, surveillance, etc.	Select an operation from the drop down list. An operation is the type of work done (i.e. light trap, sticky trap, fly trap, caulking). If the operation is not listed, then type in the operation.	Select a target pest from the drop down list that you were attempting to survey or control by a nonchemical measure. If the target pest isn't listed, then write the target pest in the additional comments field.	Select the device name used for surveillance/nonchemical control from the drop down list below (i.e., CDC Light trap, Shannon trap). Type in the device name if not listed in the drop down list.	Type in the number of traps/devices used.	Select the unit of measure (if applicable), otherwise leave it blank.	Type in the size of the area inspected/serviced. It needs to be a number between 0 and 1000000. Use decimals if needed.	Select the appropriate unit of measure (i.e. square feet, meters, acres, etc.) related to the area inspected/serviced from the drop down list.
Date	**Country**	**Base Camp**	**Site of Application/Surveillance**	**Origin**	**Operation**	**Target Pest**	**Surveillance/Nonchemical D**	**Number of traps/Units**	**Units of Measure**	**Area Inspected/Serviced**	**Units of Measure for the Area Inspected/Serviced**
2012-06-01	Afghanistan	Aryan	Dining Facility (DFAC)	Work Request	Trapping	Rodent	Glue Board/Sticky Trap	2	EA	80	square feet
2012-06-01	Afghanistan	Aryan	Area 3	Routine Inspection	Pest Surveillance	All Pests	Visual Surveillance	N/A		780	square feet
2012-06-01	Afghanistan	Aryan	AMPM	Work Request	Trapping	Cats	Animal Trap	2	EA	4555	square feet
2012-07-01	Afghanistan	Aryan	Dining Facility (DFAC)	Work Request	Trapping	Filth Flies	Glue Board/Sticky Trap	1	EA	2	acre
2012-07-01	Afghanistan	Aryan	Area 2	Work Request	Fly Bag Trap	Filth Flies	Fly Relief	2	EA	5	hectare

If the EPA Registration Number is selected, the active ingredient percentage for the product will automatically populate in this column (i.e. 0.005).	Type in the amount of concentrate used for mixing. If the product does not require mixing and is ready to be used please select "N/A".	Select the appropriate units of measure related to the amount of concentrate from the drop down list (i.e. ounce, pound, etc.). If the product does not require mixing and is ready to be used please select "N/A".	Type in the Final % Concentration in the Finished Product. If the product does not require mixing and is ready to be used please select "N/A".	Type in the amount of finished product applied. For products that are formulated as Aerosols, please indicate the number of can(s) used. This estimate will be useful in calculating the total Pounds of Active Ingredient (PAI) applied.	Select the appropriate units of measure related to the amount of finished product applied from the drop down list (i.e. ounce, pound, etc.).	Type in the name of the person (i.e. John Doe) who applied the pesticide.	Type in the applicator's DoD FIFRA, DoD Non-FIFRA, or State Certification Number.	Type in the exact time in which the pesticide was applied at the site. The preferred format is hh:mm (i.e. 09:45).	Type in the total time invested by all applicators in the operation in hours (i.e. 1).	Provide any additional comments.
Active Ingredient Percentage	**Amount of Concentrate Used for Mixing**	**Units of Measure for the Amount of Concentrate Used for Mixing**	**Final % Concentration in Finished Product**	**Amount of Finished Product Applied**	**Units of Measure for the Amount of Finished Product Applied**	**Applicator Name**	**Applicator Certification #**	**Time Pesticide was Applied**	**Total Time Invested in Hours**	**Additional Comments**
0.005	N/A	N/A	N/A	54	ounce	John Doe	OAE-096-10	9:45	1	
11.8	8	milliliter	0.025	1	gallon	John Doe	OAE-096-10	10:00	1	
0.005	N/A	N/A	N/A	20	ounce	Tom Smith	A-310-11-0707	10:00	0.25	
19	3	fluid ounce	1	12	fluid ounce	Tom Smith	A-310-11-0707	13:00	1	
1	N/A	N/A	N/A	6	each	John Doe	OAE-096-10	13:00	0.1	
0.249	N/A	N/A	N/A	6	second	Tom Smith	A-310-11-0707	9:30	0.15	
0.6	N/A	N/A	N/A	4	ounce	Tom Smith	A-310-11-0707	10:00	0.5	
41	1	quart	1	25	gallon	Tom Smith	A-310-11-0707	14:00	2	

Type in the active ingredient(s) listed on the product label (i.e. Bromadiolone).	Type in the active ingredient percentage listed on the product label (i.e. 0.005).	Type in the amount of concentrate used for mixing. If the product does not require mixing and is ready to be used please select "N/A".	Select the appropriate units of measure related to the amount of concentrate from the drop down list (i.e. ounce, pound, etc.). If the product does not require mixing and is ready to be used please select "N/A".	Type in the Final % Concentration in the Finished Product. If the product does not require mixing and is ready to be used please select "N/A".	Type in the amount of finished product applied. For products that are formulated as Aerosols, please indicate the number of can(s) used. This estimate will be useful in calculating the total Pounds of Active Ingredient (PAI) applied.	Select the appropriate units of measure related to the amount of finished product applied from the drop down list (i.e. ounce, pound, etc.).	Type in the name of the person (i.e. John Doe) who applied the pesticide.	Type in the applicator's DoD FIFRA, DoD Non-FIFRA, or State Certification Number.	Type in the exact time in which the pesticide was applied at the site. The preferred format is hh:mm (i.e. 09:45).	Type in the total time invested by all applicators in the operation in hours (i.e. 1).	For foreign/non-EPA registered products please submit an electronic copy or high resolution photo of the product label.
Active Ingredient	**Active Ingredient Percentage**	**Amount of Concentrate Used for Mixing**	**Units of Measure for the Amount of Concentrate Used for Mixing**	**Final % Concentration in Finished Product**	**Amount of Finished Product Applied**	**Units of Measure for the Amount of Finished Product Applied**	**Applicator Name**	**Applicator Certification #**	**Time Pesticide was Applied**	**Total Time Invested in Hours**	**Additional Comments**
Indoxacarb	0.5	N/A	N/A	N/A	5	each	Tom Smith	A-310-11-0707	16:15	0.25	Used to combat cockroaches resistant to hydramethylnon

Type in the name of the person (i.e. applicator) performing the work described.	Type in the applicator's DoD FIFRA, DoD Non-FIFRA, or State Certification Number.	Please type in the exact time in which the operation took place at the site. The preferred format is hh:mm (i.e. 09:45)	Type in the total time invested by all applicators in the operation in hours (i.e. 1).	Provide additional comment(s) if needed.
Applicator Name	**Applicator Certification #**	**Time of Operation**	**Total Time Invested in Hours**	**Additional Comments**
Miller, Glen	AF-001-10-0198	8:45	0.1	
Miller, Glen	AF-001-10-0198	16:10	1	
Miller, Glen	AF-001-10-0198	9:45	0.3	
Cook, Richard	PA-704174	17:35	0.2	
Cook, Richard	PA-704174	13:15	0.75	

APPENDIX F

CURRENT PESTICIDE APPLICATORS CERTIFICATIONS

DOD Certified Pesticide Applicators and their Certification Numbers

(All State of Florida Certifications)

Name	Company	Certification No.	Expiration Date
Sharp Shot, Inc.*	Sharp Shot, Inc	JB3118	31 MAR 2015
Advincula, Ivan A.	Sharp Shot, Inc.	JE135464	31 MAR 2015
Grissett, Albert P.	Sharp Shot, Inc.	JE48250	31 MAR 2015
Morales, Eddie E.	Sharp Shot, Inc	JE1509	31 MAR 2015
Romero, Jorge L.	Sharp Shot, Inc	JE58809	31 MAR 2015
Piloto, Antonio E.	Maintenance Engineers, Inc.	CM22204	31 MAR 2017

* Pest Control Firm Certification

STATE OF FLORIDA
ilrpnrtment of ggrirulrurt anb el:ons-umer trbicrs-
BUREAU OFENTOMOLOGY & PEST CONTROL

Date	l'ilc No.	fapircs
February 5, 2014	JE58809	March 31,2015

THE ID **CARD HOLDER** NAMED BELOW HAS REGISTERED UNDER THE PROVISIONS OF CHAPTER 482 FOR THE PERJOD EXPIRING -
March 31, 2015 **AT ·**

SHARP SHOT INC
MIAMI, FL 33158

JORGE L ROMERO
SHARP SHOTINC
6963 SW 151 STREET
MIAMI, FL 33158

Regular

ADAM H. PUTNAM, COMMISSIONER

STATE OFFLORIDA
11\epnrtmtnt of !Jriculturt anb <!ons-umrr .i>rrlJictS'
BUREAU OPENTOMOLOGY & PEST CONTROL

Date	File No.	Expires
February S, 2014	JEl35464	March 31,2015

THE ID **CARD HOLDER** NAMED BELOW HAS REGISTERED UNDER THE PR0V1SI0NS OF CHAPTER 482 FOR THE PERJOD EXPfRJNG:
March 31, 2015 **AT**

SHARP SHOT INC
MIAMI, FL 33158

VAN A ADVINCULA
SHARP SHOTINC
6963SW 151STREET
MIAMI, FL 33158

Wood Destroying Organism Inspector
Certified Operator - Fumigation

ADAM H. PUTNAM, COMMISSIONER

STATE OF FLORIDA
i\rp11rtmtnt ot !Jriculturc 1111b QC011S'tm1r-r.i>crbicts
BUREAU Of ENTOMOLOGY & PEST CONTROL

Date	File No.	Expires
February S, 2014	JE48250	March 31,2015

THE ID **CARD HOLDER** NAMED BELOW RAS REGISTERED UNDER THE PROVISIONS OF CHAPTER 482 FOR THE PERJOD EXPIRING:
March 31,2015 AT

SHARP SHOTINC
MIAMI. FL 33158

ALBERT P GR1SSETI
SHARP SHOT INC
6963SW 151STREET
MIAMI, FL 33158

Regula.r

ADAM H. PUTNAM, COMMISSIONER

STATE OF FLORIDA
ZBepartmrnt of grirnlturr anb «:onsnmrr erutres
BUREAUOF ENTOMOLOGY & PEST CONTROL

Date	File No.	I:lxpircs
F'cbruary S, 2014	183118	March JI , 2015

THE **PEST CONTROL FIRM** NA M.ED BELOW HAS REGrSTERUD UNDER THE PROVISJONS OF CRAPTER 482 FOR THE PERIOD EXPIRING: **March 31, 2015** **AT**

6963 SW 151 STRElln
MIAM I, FL 33158

SHARP SHOT INC
6963 SW 151 STREET
MIA MI, FL 33158

General Household Pest and Rodent Control
Lawn and Ornamental
Termite u nd Other WOO Control

c2c;' -
ADAM H. rUTNAM , COMMISDNER

STATE OF FLORIDA
ZBepnrt nm1t of giulturt nnb etonsumer er\Jicts
BUREAU OF ENTOMOLOGY & PEST CONTROL

Date	File No.	Expires
February S, 2014	JE1509	March 31,2015

THE ID CARD HOLDER NAMED BELOW HAS REGJSTERED UNDER TliE PROVlSlONS OF CHAPTER 482 FOR THE PERIOD EXPIRING: March 31, 2015 AT

SHARP SHOT INC
MIAM I , FL 33158

EDDIE E MORA LES
SHARP SHOT INC
6963 SW 151 STREET
MIAM I, FL 33158

Certified Operator
Wood Destroying Organism Inspector

c:2(; -
ADAM M. PUTNAM, COMMISSIDNER

, - • .1loriba ;iltc if 'lr i Ulttt lln-: ll!'Unt - trbictl/ -

Pesticide:Crtillcation Office

erdo.J Applicator Liceiise

. Lice)i.se'# CMll-204

P|LOTq}l:iTq!O WAS

351Nff ll DR.l.YE

HOMBS7EAD,.FL'330l?

Cale/i; i (;

Issued: March 25, 2013 !fch 1;2017

Signature of Licensee

J\DAMl! r:nrt,M.C',IMMISStON'E.'I

The above individual is licensed under the provisions of Chapter 487, F.S. to purchase and apply restricted use pesticides.

Appendix E
Protected Plant Management Plan

FINAL

Protected Plant Management Plan Homestead Air Reserve Base, Homestead, Florida

Prepared for

Homestead Air Reserve Base

July 2015

CH2MHILL®

6600 Peachtree Dunwoody Road
Suite 600
Atlanta, Georgia 30328

Table of Contents

Appendixes

Figure

Tables

Acronyms and Abbreviations

AAF	Army Air Field
AFB	Fir Force Base
AFI	Air Force Instruction
AFPMB	Armed Forces Pest Management Board
ARB	Air Force Base
ARS	Air Reserve Station
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Restoration, Compensation, and Liability Act
cm	centimeter
FDNR	Florida Department of Natural Resources
FNAI	Florida Natural Areas Inventory
FW	Fighter Wing
HARB	Homestead Air Reserve Base
HQ AFRC	Headquarters Air Force Reserve Center
INRMP	Integrated Natural Resources Management Plan
IPP	invasive pest plant
IRC	Institute for Regional Conservation
mm	millimeter
PPMP	Protected Plant Management Plan
USFWS	U.S. Fish and Wildlife Service

Executive Summary

This Protected Plant Management Plan (PPMP) identifies measures that may be implemented to manage the habitat for Small's milkpea (*Galactia smallii*), sand flax (*Linum arenicola*), and other state-protected species occurring at Homestead Air Reserve Base (HARB) in Homestead, Florida (IRC and URS, 2013; Golder Associates Inc., 2012). This PPMP identifies a specific work plan for managing these resources to accomplish Headquarters Air Force Reserve Center (HQ AFRC) and HARB's resource-specific goals and objectives as identified in the installation's Integrated Natural Resources Management Plan (INRMP). This PPMP will be used to supplement and update the existing INRMP for HARB.

Management would be primarily focused on restoring the remnant pine rockland area (approximately 5.1 acres) and the old grenade range (approximately 10.17 acres) to pine rockland restoration areas. Management would follow an adaptive approach and it is expected that the plan will be revised and updated every 5 years with the INRMP, or more frequently as appropriate. The key management approaches include:

- Chemical control of woody and herbaceous Invasive Pest Plants
- Mowing
- Native pine and grassland propagation
- Seed collection/distribution

Annual monitoring and maintenance activities for protected plant species would be recorded, and the documentation would be submitted in accordance with reporting requirements of the INRMP. Information reported would include discussion of:

- The status of protected species
- The efficacy of management actions implemented
- Trend data on species populations
- Information on whether the management approach needs to be modified moving forward

Protected species within the two restoration areas (remnant pine rockland area and old grenade range) would be monitored on a yearly basis. The remainder of HARB would be monitored for protected species on a 3-year rotation.

Chapter 1 Introduction

This Protected Plant Management Plan (PPMP) identifies measures that may be implemented to manage the habitat for Small's milkpea (*Galactia smallii*), sand flax (*Linum arenicola*), and other state protected species occurring at Homestead Air Reserve Base (HARB) in Homestead, Florida. This PPMP identifies a specific work plan for managing these resources to accomplish Headquarters Air Force Reserve Center (HQ AFRC) and HARB's resource-specific goals and objectives as identified in the installation's Integrated Natural Resources Management Plan (INRMP). This PPMP will be used to supplement and update the existing INRMP for HARB.

This PPMP was prepared in accordance with Air Force Instruction (AFI) 32-7064 – Integrated Natural Resources Management and the Sikes Act (16 United State Code 670a et seq.), which require the planning, development, and maintenance of natural resources at military installations throughout the United States.

Two pine rockland plant species endemic to south Florida, Florida brickell bush (*Brickellia mosieri*) and Carter's small-flowered flax (*Linum carteri* var. *carteri*), were recently listed as federally endangered and critical habitat was established for these plants. To date, neither species has been documented as occurring within HARB, and the designated critical habitat for the species is outside HARB boundaries. If these plants are identified on HARB in the future, the PPMP will be revised to include these species and appropriate management and monitoring activities will be implemented.

Three surveys for rare and protected plants have been conducted on the adjacent former Homestead Air Force Base (AFB) property (IRC, 2009a; IRC, 2009b; IRC, 2013). The surveys identified six state-protected plants that have not been identified on HARB, including the endangered Coker's beach creeper (*Ernodea cokeri*) and pineland spurge (*Poinsettia pinetorum*) and the threatened West Indian mahogany (*Swietenia mahagoni*), Bahama sachsia (*Sachsia polycephala*), abrupt-tip maiden fern (*Thelypteris augescens*), and rockland noseburn (*Tragia saxicola*). Should future surveys identify these state-protected species on HARB, the PPMP will be revised to include these species and appropriate management and monitoring activities will be implemented.

Chapter 2 Site Description

HARB encompasses 1,943 acres in Miami-Dade County, Florida. HARB is located approximately 25 miles southwest of the city of Miami, approximately 2 miles west of Biscayne Bay National Park, and 8 miles east of Everglades National Park. The installation was founded as Homestead Army Air Field (AAF) in September 1942. The installation was closed in 1945 after a hurricane caused extensive damage. The installation was rebuilt and opened in 1953 as a Strategic Air Command base named Homestead AFB. Hurricane Andrew struck the 2,938-acre Homestead AFB in 1992, causing extensive property damage. In 1993, Homestead AFB was placed on the Base Realignment and Closure (BRAC) list, and the USAF determined approximately 1,632 acres of the base as excess. Homestead AFB was closed in 1994, and over 1,800 acres was made available to Miami-Dade County, Florida. The remaining approximately 852 acres were retained for use by the Air Force Reserve Command as the Homestead Air Reserve Station (ARS) (HARB, 2009).

From 1994 to 2002, portions of the former Homestead AFB were transferred between the USAF and Miami-Dade County for mixed-use redevelopment. In 2003, the 482nd Fighter Wing (FW) stationed at Homestead ARS assumed ownership of approximately 1,091 additional acres, including the airfield, runway, airfield apron, control tower, and Boundary Canal System to become HARB. Management of the Military Canal was also transferred to the 482nd FW following the Comprehensive Environmental Restoration, Compensation, and Liability Act (CERCLA) remedial actions. In summary, approximately 1,943 acres of the former Homestead AFB have been retained for use by the 482nd FW, including the airfield. The remaining 1,000 acres of the former Homestead AFB have been conveyed or leased to a variety of outside entities (HARB, 2009).

The land encompassing HARB was historically a mixture of freshwater marsh and pine rockland habitat (HARB, 2009). Pine rockland is characterized by a sparse Florida slash pine (*Pinus elliottii*) canopy with shrubs and palms forming the understory and a variable groundcover of herbs and grasses. Typical plants include rough velvetseed (*Guettarda scabra*), white indigo berry (*Randia aculeata*), varnish leaf (*Dodonaea viscosa*), myrsine (*Myrsine floridana*), cabbage palm (*Sabal palmetto*), saw palmetto (*Serenoa repens*), Florida bluestem (*Schizachyrium rhizomatum*), silver bluestem (*Andropogon cabanisii*), Florida five-petaled leaf flower (*Phyllanthus pentaphyllus*), Rocklands noseburn (*Tragia saxicola*), and pineland jacquemontia (*Jacquemontia curtisii*), also known as pineland cluster vine (HARB, 2009).

Pine rockland occurs on relatively flat, well-drained terrain over limestone bedrock. The limestone bedrock is found near the surface, and soils are generally limited to small accumulations of sand, marl, and organic material in depressions and crevices in the rock surface. Fire is an important factor in maintaining pine rockland habitat by clearing understory development. In pre-Columbian times, fires likely occurred naturally every 3 to 10 years. In areas where understory development has progressed more than 8 to 10 years, fire would likely not penetrate or would be catastrophic (FNAI and FDNR, 1990).

Pine rocklands are unique to Cuba, the Bahamas, and the southernmost portion of Florida, including scattered populations in the Florida Keys. In Florida, over 98 percent of the original pine rockland habitat outside Everglades National Park has been destroyed, primarily from development, and the remaining habitat is in poor condition due to fire suppression, exotic infestations, particularly Brazilian pepper (*Schinus terebinthifolius*), and improper management (Golder Associates Inc., 2012; FNAI and FDNR, 1990). In 1992, high winds from Hurricane Andrew severely damaged slash pine canopy trees of the remaining south Florida pine rocklands. The damaged trees were stressed and attacked by bark or boring beetles, particularly the six-spined Southern pine beetle, causing further damage to these communities. As a result, several species endemic to pine rockland habitat are considered endangered, threatened, or rare because of the widespread destruction of the community (HARB, 2009).

Remnant pine rockland habitat is located in the far northwest corner of HARB. The approximately 3-acre area is bordered by an unpaved road and the Bulk Fuel Storage area to the east, Elmendorf Street and the base transportation facility to the south, and the Boundary Canal, which borders the north and west sides. A charter middle school and commercial development are also present west of the area opposite the Boundary Canal.

Miami oolite, a limestone composed of small, round pellets of calcium carbonate, comprises the surficial rock in the remnant habitat. The soils are predominantly a complex mixture of Cardsound soils and rock outcrop. The Cardsound series consist of very shallow, moderately well drained soils over porous limestone bedrock. Both geology and soils are characteristic of pine rockland habitat (Golder Associates Inc., 2012).

The slash pine canopy was largely destroyed by winds during Hurricane Andrew and the insect infestation that followed the storm. Invasive species have colonized and now dominate the site, including Australian pine (*Casuarina equisetifolia*), Burma reed (*Neyraudia reynaudiana*), and Brazilian pepper. However, native plants typical of pine rockland, including mature and sapling slash pine, poisonwood (*Metopium toxiferum*), willow bustic (*Sideroxylon salicifolium*), rough velvetseed, and white indigo berry, were identified on the site during the survey. Several additional State listed species were also identified, including the Florida clover ash (*Tetrazygia bicolor*), locustberry (*Byrsonima lucida*), ground lantana (*Lantana depressa*), also known as rockland shrub verbena and pineland lantana, and pineland jacquemontia. No federally protected plants were observed in the 3-acre remnant pine rockland area (Golder Associates Inc., 2012).

Chapter 3 Species Descriptions

3.1 Small's Milkpea (*Galactia smallii*)

Small's milkpea (*Galactia smallii*) is a federally endangered plant endemic to the pine rockland habitat occurring in Miami-Dade County (Figure 1). The plant was listed as federally endangered on July 18, 1985 due to the extensive loss of pine rockland habitat. No critical habitat has been designated for the species. Small's milkpea is also listed as endangered in the state of Florida (U.S. Fish and Wildlife Service [USFWS], 1999).

Small's milkpea is a small, trifoliate, perennial legume with small, purple flowers and a prostrate habit. The stems grow up to 2 meters (m) long (approximately 6.6 feet) and are grayish in color due to a covering of short hairs. The leaves are broadly ovate to elliptic, 1 to 2.2 centimeters (cm) (approximately 0.4 to 0.9 inch) in length, and alternate. The undersides of the leaves have long, soft, wavy hairs lying almost flat against the surface. The upper surface of the leaves is hairless or has sparse, stiff hairs that lie flat against the surface. The inflorescences are 2 to 6 cm (approximately 0.8 to 2.4 inches) in length with 1 to 5 flowers at the apex or along the axis. The flower buds are 5 to 7 millimeters (mm) (approximately 0.2 to 0.3 inch) long, and the calyx is approximately 7 mm (approximately 0.3 inch) long. The corolla is 11 to 12 mm (approximately 0.4 to 0.5 inch) long and pinkish purple or lavender. The legume is 3 to 4 cm by 4 mm in size (approximately 1.2 to 1.6 inches by 0.2 inch) and is strigulose or villousulous (USFWS, 1999; Bradley and Possley, 2002).

Small's milkpea typically flowers during the dry summer months, but may flower throughout the year. Small's milkpea may produce fruit throughout the year, and seeds are dispersed from explosive dehiscence of seed pods. Most of the flowers do not produce fruit. Flowering may be intensified and synchronized following a burn, and seeds germinate in response to fire. Three species of bees, one species of wasp, and the Cassius blue butterfly (*Leptotes cassius theonus*) are the primary pollinators of the Small's milkpea (USFWS, 1999; Bradley and Possley, 2002).

The preferred Redland pine rockland habitat of Small's milkpea is characterized by a slash pine canopy with a saw palmetto, wax myrtle (*Myrica cerifera*), poisonwood, and willow bustic shrub layer. Small's milkpea may also be found with crimson bluestem (*Schizachyrium sanguineum* var. *sanguineum*), wire bluestem (*Andropogon gracilis*), scaleleaf aster (*Symphyotrichum adnatum*), and bastard copperleaf (*Acalypha chamaedrifolia*). Small's milkpea is more abundant in Cardsound rock outcrop complex soils with little quartz sand and prefers open sun with little shade (USFWS, 1999; Bradley and Possley, 2002).

3.2 Sand Flax (*Linum arenicola*)

Sand flax (*Linum arenicola*) is a federal candidate species and a state endangered species endemic to Miami-Dade and Monroe Counties in south Florida. Sand flax occurs in pine rockland, disturbed pine rockland, marl prairie, and roadsides on rocky soils. The plant's

distribution is threatened primarily by extensive development, exotic pest plants, and lack of controlled fire (Bradley and Gann, 1999).

Sand flax is a glabrous, perennial herb with small, yellow flowers. The stems are wiry and grow to 35 to 53 cm (approximately 13.8 to 20.9 inches) tall. The leaves are linear, 7 to 10 mm (approximately 0.3 to 0.4 inch) in length, 0.6 to 1 mm (approximately 0.02 to 0.04 inch) wide, predominantly alternate, and entire or with scattered marginal glands. The stipules are glandular and reddish. The inflorescence is a cyme of a few slender, spreading or ascending branches with 2 mm (approximately 0.08 inch) long or less pedicels, lanceolate to ovate 2.4 to 3.2 mm (approximately 0.09 to 0.13 inch) long sepals with a prominent midrib, and yellow, obovate petals 4.5 to 5.5 mm (approximately 0.18 to 0.22 inch) in length. The fruit is 2.1 to 2.5 mm by 2 to 2.3 mm (approximately 0.08 to 0.10 by 0.08 to 0.09 inch), pyriform, and dehiscing into 10 segments (Bradley and Gann, 1999).

Sand flax typically flowers and produces fruit from March through November. The petals fall shortly after the flowers open in the morning (FNAI, 2000a). Sand flax grows on oolitic limestone formations in pine rockland, marl prairie, and disturbed areas. Preferred habitat is characterized by slash pine canopy with a shrub understory of saw palmetto, wax myrtle, poisonwood, and willow bustic. Several palm species including the Florida thatch palm (*Thrinax radiata*), Key thatch palm (*Thrinax morrisii*), and Florida sliver palm (*Coccothrinax argentata*, state-threatened) may occur in the shrub understory along with several hardwood species such as locustberry, long-stalked stopper (*Psidium longipes*), and smooth devilsclaws (*Pisonia rotundata*). Sand flax is often associated with crimson bluestem, wire bluestem, scaleleaf aster, bastard copperleaf, silver dwarf morning-glory (*Evolvulus sericeus*), and eyebright ayenia (*Ayenia euphrasiifolia*). Sand flax may also occur with other rare herbaceous species such as Carter's small-flowered flax (proposed for listing under the Endangered Species Act), Blodgett's wild-mercury (*Argythamnia blodgettii*), wedge sandmat (*Chamaesyce deltoidea* ssp. *serpyllum*), Big Pine partridge pea (*Chamaescrista lineata* var. *keyensis*), and Mexican alvaradoa (*Alvaradoa amorphoides*) (Bradley and Gann, 1999).

3.3 Other State and County Listed Species

Several state-protected species endemic to pine rocklands and other south Florida habitats are also known to occur at HARB. These additional state protected species are listed in Table 3-1 and described below.

Pineland Golden Trumpet (*Angadenia berteroi*)

Pineland golden trumpet (*Angadenia berteroi*) is an evergreen erect, sub-erect, or ascending shrub that sometimes reclines and appears vine-like. The species grows in pine rockland habitat in Miami-Dade County, in the Florida Keys, and on the islands of the West Indies. The opposite leaves are leathery and entire, ovate to oblong, and 0.5 to 1.25 inches in length. The flowers are bright yellow, bell-shaped with spreading petals. When fully open, flowers are 1.25 to 1.75 inches in diameter. Flowers occur throughout the year. Fruits are slender cylindrical follicles from 2 to 4 inches long (Nelson, 1996; Wunderlin and Hansen, 2011).

TABLE 3-1
State Listed Species
HARB Protected Plant Management Plan

Common Name	Scientific Name	State Status
Pineland golden trumpet	*Angadenia berteroi*	Threatened
Pinepink	*Bletia purpurea*	Threatened
Locustberry	*Byrsonima lucida*	Threatened
White sunbonnets	*Chaptalia albicans*	Threatened
Florida silver palm	*Coccothrinax argentata*	Threatened
Quailberry	*Crossopetalum ilicifolium*	Threatened
Blodgett's swallowwort	*Cynanchum blodgettii*	Threatened
Man-in-the-ground	*Ipomoea microdactyla*	Endangered
Pineland cluster vine	*Jacquemontia curtisii*	Threatened
Rockland shrub verbena	*Lantana depressa*	Endangered
Pineland black anthers	*Melanthera parvifolia*	Threatened
Wedgelet fern	*Odontosoria clavata*	Endangered
Southern fogfruit	*Phyla stoechadifolia*	Endangered
Long-stalked stopper	*Psidium longipes*	Threatened
Bahama ladder brake	*Pteris bahamensis*	Threatened
Small-leaf snoutbean	*Rhynchosia parvifolia*	Threatened
Havana skullcap	*Scutellaria havanensis*	Endangered
Eaton’s spike-moss	*Selaginella armata* var. *eatonii*	Endangered
Bahama senna	*Senna mexicana* var. *chapmanii*	Threatened
Everglades greenbrier	*Smilax havanensis*	Threatened
Everglades false buttonweed	*Spermacoce terminalis*	Threatened
Everglades key pencilflower	*Stylosanthes calcicola*	Endangered
Florida clover ash	*Tetrazygia bicolor*	Threatened

Sources: IRC and URS, 2013 (Appendix A); Golder Associates Inc., 2012

Pinepink (*Bletia purpurea*)

Pinepink (*Bletia purpurea*) is a predominantly terrestrial orchid of rocky pinelands in south Florida, but also grows on cypress knees, stumps, and floating logs in swamps. The linear-lanceolate leaves are up to 6 to 18 inches long and between 1 and 2 inches wide. The flower spike arises from the base and can extend up to 5 feet. Flowers are 0.5 to 0.75 inch wide, pale pink to bright pale-pink, with two prominent lateral sepals that may have a yellow stripe. The flower lip is yellow and has conspicuous linear ridges extending from front to back (Hammer, 2002; Wunderlin and Hansen, 2011).

Locustberry (*Byrsonima lucida*)

The locustberry (*Byrsonima lucida*) is a small tree or shrub occurring in pine rockland habitat in Florida and throughout the Caribbean. The locustberry has 1- to 2-inch, obovate and opposite leaves. The flowers are in racemes 1 to 2.4 inches long with white or pink petals and a calyx with 10 oblong glands on the outside. Fruits are 0.35 to 0.47 inch wide and fleshy and yellowish when ripe. The locustberry flowers from May through the summer. In native pine rockland habitats with periodic fires, the locustberry remains less than 3 feet tall. However, in unburned environments, the plant can grow to 30 feet. A variety of bees pollinate the flowers, and various animals eat the berries (Austin, 1997).

White Sunbonnets (*Chaptalia albicans*)

The white sunbonnets (*Chaptalia albicans*) are endemic to pineland habitats in Miami-Dade County, Mexico, the West Indies, and Central America. Individual leaves are approximately 1 to 5 inches in length, sessile, with serrulate to denticulate-apiculate margins, and are greenish above and whitish beneath. Leaves occur as a basal rosette with the leaves flat on the ground. The flower stalk is leafless and is topped by a single inflorescence composed of all ray flowers. Ray flowers are white and rarely purple-tinged (Nelson, 2005; Wunderlin and Hansen, 2011; FNA, 2008).

Florida Silver Palm (*Coccothrinax argentata*)

The Florida silver palm (*Coccothrinax argentata*) occurs in Florida and the West Indies. The palm grows to 24 feet in height with 8- to 31-inch wide, fanlike leaf blades that are green above and silvery below. The leaf stem also lacks teeth. The fruits are 0.27 to 0.39 inch wide, spherical, and black. The Florida silver palm flowers throughout the year, but primarily in spring and summer. The flowers provide pollen and nectar to a variety of insects, and various animals eat the fruit (Austin, 1997).

Quailberry (*Crossopetalum ilicifolium*)

Quailberry (*Crossopetalum ilicifolium*), also known as Christmasberry, is a shrub that occurs in south Florida, Cuba, and the Bahamas. The quailberry has prostrate, spreading, and hairy stems and 0.39- to 1-inch, elliptic to ovate leaves with toothed edges. The flowers are in cymose clusters on short stalks with 0.04- to 0.06-inch long, orbicular and red petals. Fruits are 0.12- to 0.19-inch red drupes. The quailberry flowers and produces fruit year-round. The flowers are inconspicuous, but the fruits are distinctive red berries. Multiple species of birds and mammals forage on the fruits, which aides in seed dispersion and germination (Austin, 1997).

Blodgett's Swallowwort (*Cynanchum blodgettii*)

Blodgett's swallowwort (*Cynanchum blodgettii*) is a perennial twining vine that exudes milky sap if the leaves or stem are broken. The opposite leaves are lanceolate, 0.5 inch long

and 0.25 inch wide. The white flowers are 5-lobed, with hairs on the inner surface of the lobes, and occur in clusters along the vine. Flowers measure approximately 0.2 inch long and 0.1 inch wide. The species may bloom all year. Blodgett's swallowwort occurs in pine rocklands and tropical hammocks in Miami-Dade and Monroe Counties in Florida and in the West Indies (Hammer, 2002; Wunderlin and Hansen, 2011).

Man-in-the-Ground (*Ipomoea microdactyla*)

The man-in-the-ground (*Ipomoea microdactyla*), also known as the wild potato morning-glory, occurs in pine rockland habitats in Florida, Cuba, and the Bahamas. The man-in-the-ground is a twinning vine with hairless, fleshy stems and 1.2- to 4-inch, lance-shaped and alternate leaves. The leaves are entire or occasionally have 5 to 7 lobes, and the leaf stalks are up to 2.4 inches long. The flowers are showy bright red and funnel-shaped with stamens and style extending outside the tube. The flaring portion is approximately 1 inch across with 5 small tips, and the tube portion is 1 to 1.5 inches long. The sepals are rounded or triangular. The fruit is a brown capsule. The man-in-the-ground flowers from April to November (FNAI, 2000b).

Pineland Cluster Vine (*Jacquemontia curtisii*)

The pineland cluster vine (*Jacquemontia curtisii*) is endemic to pine rocklands in Collier, Miami-Dade, and Monroe Counties. The pineland cluster vine has prostrate, reclining, or erect hairy stems growing up to 3 feet long. The leaves are 0.39 to 0.78 inch long and elliptic to spoon-shaped. Flowers are white, saucer-shaped, and 0.78 to 1.2 inches wide. The calyx lobes are ovate to almost circular and generally equal in length. The fruits are capsules 0.19 to 0.24 inch long. The pineland cluster vine flowers and produces fruit year-round, and is pollinated by three genera of native bees. The pineland cluster vine is generally confined to alkaline, limestone soils and dependent on periodic fires (Austin, 1997; FNAI, 2000c).

Rockland Shrub Verbena (*Lantana depressa*)

The rockland shrub verbena (*Lantana depressa*) is endemic to the pine rocklands of Miami-Dade County, particularly the Everglades keys. The rockland shrub verbena is a low, mat-forming shrub that grows to approximately 1 foot tall. The leaves are 2 inches long by 1 inch wide, oval to lance-shaped, and toothed with wedge-shaped bases. The leaves also fold up along the midvein and occur opposite on the stem. The flowers occur in 15 to 20 flat-topped clusters and are bright yellow-gold but fade to orange. The fruit is fleshy and shiny black. The rockland shrub verbena flowers and fruits all year and is known to hybridize with the exotic shrub verbena (*Lantana camara*) (Austin, 1997; FNAI, 2000d).

Pineland Black Anthers (*Melanthera parvifolia*)

The pineland black anthers (*Melanthera parvifolia*) is an herb endemic to the south Florida pinelands. The pineland black anthers has rough hairy stems and grows between 12 and 39 inches tall. The leaves are 0.12 to 0.19 inch long, rough, and ovate to deltoid with toothed or almost entire edges. The flowers are 0.12 to 0.15 inch long and white with black anthers. The pineland black anthers flowers in the spring and summer and is pollinated by a variety of bee species. The pineland black anthers prefers mostly sunny pine rockland habitats and disappears as the area becomes shaded. The exotic Burma reed and Napier grass are overpopulating pine rockland habitats, and the shade prevents growth of the pineland black anthers (Austin, 1997).

Wedgelet Fern (*Odontosoria clavata*)

The wedgelet fern (*Odontosoria clavata*) occurs in pine rocklands, sinkholes, limestone ledges, and rocky glades of Florida, Mexico, and the West Indies. The wedgelet fern has 4- to 20-inch erect fronds that are closely spaced on a creeping stem. The fronds are pale yellow-green, smooth, and delicate without much leafy tissue. The fronds repeatedly divide into narrow segments that expand at the tip into a wedge-shaped, cup-like sorus. Ragged and toothed flaps of tissue surround each sorus (FNAI, 2000e).

Southern Fogfruit (*Phyla stoechadifolia*)

Southern fogfruit (*Phyla stoechadifolia*) is an erect herbaceous perennial plant with few branches that occurs in freshwater wetlands, typically wet pinelands or wet glades, of south Florida, Mexico, and the West Indies. The plant grows to 2 feet in height, has opposite, linear-lanceolate, toothed leaves that are up to 2 inches long and 0.4 inch wide. Stem leaves are roughly hairy, with the hairs attached at the base. Flower stalks arise from leaf axils, extending up to 4 inches, terminating in a dense head with tiny pink tubular flowers (Hammer, 2002; Wunderlin and Hansen, 2011).

Long-stalked Stopper (*Psidium longipes*)

The long-stalked stopper (*Psidium longipes*) occurs in pine rockland and rockland hammock habitats of Miami-Dade and Monroe Counties and in the Bahamas. The long-stalked stopper is an evergreen shrub or small tree growing up to 12 feet tall with thin, flaking bark and a twisted trunk. The leaves are approximately 1 inch long, simple, entire, oval to nearly round, and opposite with reddish, translucent veins and gland dots on the underside. The flowers are approximately 0.5 inch wide with 4 white to pink petals and numerous stamens. The flowers are solitary on approximately 1-inch long stalks. The fruit is found on long stalks, and is round and red, turning to black. The long-stalked stopper flowers in the spring and summer but may be identified year-round from leaves and fruit (FNAI, 2000f).

Bahama Ladder Brake (*Pteris bahamensis*)

Bahama ladder brake (*Pteris bahamensis*) is an erect terrestrial fern of pine rocklands and the edges of rockland hammocks. Fronds reach 3 to 6.5 feet in length, with petioles ranging from 4 to 18 inches in length. The blades are generally lanceolate or oblanceolate in outline and with widths to 6.5 inches. Pinnae margins are entire to obscurely toothed, and lateral veins are forked. Sori occur on the bottom surfaces of the pinnae. This fern grows and may produce spores all year and is limited to southern peninsular Florida (Nelson, 2000; Wunderlin and Hansen, 2011).

Small-leaf Snoutbean (*Rhynchosia parvifolia*)

Small-leaf snoutbean (*Rhynchosia parvifolia*) is a prostrate or trailing bean that grows on beaches and in pinelands of south Florida. It occurs in Miami-Dade and Monroe Counties and may flower all year. Leaves are trifoliate and flowers occur in racemes up to 2 inches in length that are shorter than or only slightly longer than the leaves. The fruit pod is from 1 to 1.5 inches in length (Wunderlin and Hansen, 2011).

Havana Skullcap (*Scutellaria havanensis*)

Havana skullcap (*Scutellaria havanensis*) is an herbaceous perennial with square stems and opposite leaves. The slender stems are covered with minute hairs and the ovate leaves are softly hairy. The leaves range from 0.4 inch to 0.6 inch in length. Flowers are dark blue,

bilabiate, and have two parallel white stripes on the three-lobed lower lip. The calyx has short, uncinate trichomes. Flowers occur in the upper leaf axils and are 0.6 inch long and 0.5 inch wide. The species occurs in rocky pinelands in south Florida, the Bahamas, and the Greater Antilles. Havana skullcap blooms all year (Hammer, 2002; Wunderlin and Hansen, 2011).

Eaton's Spike-moss (*Selaginella armata* var. *eatonii*)

Eaton's spike-moss (*Selaginella armata* var. *eatonii*) grows on moist limestone ledges and sinkhole margins in hammocks and moist pinelands. It occurs only in Miami-Dade County and grows all year. Eaton's spike-moss has bright green leaves and grows in small mats up to 2.5 inches in diameter. The largest lateral leaves are approximately 1 mm in length and less than 1 mm in width (Wunderlin and Hansen, 2011).

Bahama Senna (*Senna mexicana* var. *chapmanii*)

Bahama senna (*Senna mexicana* var. *chapmanii*) is a woody shrub that grows to 4 feet in height. Leaves are compound with 3 to 5 pairs of lanceolate or elliptical leaflets, typically 0.75 inch to 1.5 inches in length and 0.4 inch wide. The bright yellow flowers occur in clusters from branch tips or leaf axils and reach up to 1.25 inches in diameter. The fruit is a flat brown pod approximately 4 inches long. The species blooms all year, but is more prolific in fall and winter. Bahama senna occurs in pinelands, hammocks, and coastal strands of south Florida, the Bahamas, and Cuba (Hammer, 2002; Nelson, 1996; Wunderlin and Hansen, 2011).

Everglades Greenbriar (*Smilax havanensis*)

Everglades greenbriar (*Smilax havanensis*) is an evergreen, woody vine with short, stout, slightly recurved brown-tipped prickles. Stems are angled and leaves are alternate. Leaves are up to 3.1 inches long and 2.1 inches wide, with entire margins or tiny spines along the margin. Conspicuous spines typically occur along the undersurface of the midrib. Everglades greenbriar is distinguished from similar species by the complete absence of lobes or dilations at the base of the leaves and by its glabrous prickles and stems. Flowers occur in dense clusters and are small and greenish-yellow. Fruits are small, egg-shaped black berries. Everglades greenbriar blooms in the fall (Nelson, 1996; Wunderlin and Hansen, 2011).

Everglades False Buttonweed (*Spermacoce terminalis*)

Everglades false buttonweed (*Spermacoce terminalis*) is an herbaceous perennial plant that grows up to 1 foot in height. The species is endemic to the pinelands and coastal areas from central Florida to the lower Florida Keys. The opposite, linear leaves reach 1 inch long and 0.1 inch wide. The white flowers occur in compact terminal clusters (occasionally also in the axils of the next lower leaf pair). The small flower may reach just over 0.1 inch in length. Everglades false buttonweed flowers all year (Hammer, 2002; Wunderlin and Hansen, 2011).

Everglades Key Pencilflower (*Stylosanthes calcicola*)

The Everglades key pencilflower (*Stylosanthes calcicola*) is a perennial herb that occurs in Mexico, Guatemala, Cuba, and Miami-Dade and Monroe Counties. The Everglades key pencilflower prefers pine rocklands and marl prairies, particularly the transition zones between the two communities. The Everglades key pencilflower has thin, wiry, and spreading stems with alternate leaves that consist of three 0.5-inch long leaflets. The

leaflets are smooth, oval to lance-shaped, and have three to five pairs of conspicuous veins. The leaf stalk is tubular with a seven-nerved sheath ending in two long teeth. The yellow flowers occur in clusters of two or more at the end of stems and are typically pea flower-shaped with a large banner petal. The fruit is a hairy pod usually with a straight tip. The Everglades key pencilflower flowers and produces fruit year-round (FNAI, 2000g).

Florida Clover Ash (*Tetrazygia bicolor*)

The Florida clover ash (*Tetrazygia bicolor*), also known as the West Indian lilac, is a shrub or small tree occurring in pine rockland habitats of Miami-Dade County, the Bahamas, and Cuba. The Florida clover ash can grow up to 40 feet tall. The leaves are 0.8 inch to 1.6 inches long with 3- to 8-inch long, lanceolate or lanceolate-ovate, and strongly ribbed blades. The blades are green above and white on the underside. The flowers are 4- to 8-inch long stalked panicles with 4 white petals approximately 0.3 inch long. The fruits are approximately 0.3 inch diameter purple or black spherical berries. The Florida clover ash sporadically flowers and fruits throughout the year (Austin, 1997).

3.4 Distribution of Listed Plants within Project Area

Small's milkpea and sand flax are generally concentrated in the west-central portion of HARB, primarily in the munitions area, but they occur scattered throughout much of HARB [Figures 1-9 and IRC and URS, 2013 (Appendix A)]. The western and northern portions of HARB have higher elevations and are outside of the 500-year floodzone. The munitions area is less disturbed and habitat quality is higher than in the developed administrative and industrial support area of HARB. However, additional occurrences of Small's milkpea, sand flax, and state protected plants have been observed in the northwest portion of HARB on Cardsound silt clay loam – rock outcrop complex soils, indicative of remnant pine rockland habitats (HARB, 2009).

The populations of Small's milkpea and sand flax are summarized in Table 1 in Appendix B and depicted in Figures 2-9. The distribution of state protected plants is listed in Table 2 in Appendix B. Estimated populations for state protected species have not been developed.

Chapter 4 Management Actions

This section identifies the management actions that would be implemented under this plan and incorporated into the INRMP. Management would be primarily focused on restoring the remnant pine rockland area (approximately 5.1 acres) and the old grenade range (approximately 10.17 acres) to pine rockland restoration areas. Management would follow an adaptive approach and it is expected that the plan will be revised and updated every 5 years with the INRMP or more frequently, as appropriate. Management would likely begin as annual efforts within each area, but as these habitat conditions improve and exotic species are more under control, active management in smaller areas could transition to longer intervals, depending on site-specific needs.

4.1 Invasive Pest Plant Control

Several invasive pest plants (IPPs) occur on HARB, including Australian pine, Brazilian pepper, Bermuda grass (*Cynodon dactylon*), zoysia grass (*Zoysia tenuifolia*), centipede grass (*Eremochloa ophiuroides*), Napier grass (*Pennisetum purpureum*), bahia grass (*Paspalum notatum*), St. Augustine sod, Burma reed, creeping oxeye (*Wedelia trilobata*), Melaleuca tree (*Melaleuca quinquenervia*), and shoebutton ardisia (*Ardisia elliptica*) [EEM, 2005; IRC and URS, 2013 (Appendix A)]. Control measures differ depending on the species being targeted, with obvious differences in the approach to controlling woody IPPs compared to herbaceous IPPs. Control of woody IPPs poses little risk to non-target species, including Small's milkpea and sand flax, and these control efforts can be implemented without special measures as long as the woody species root mass is left in place and no ground disturbance occurs. However, because the herbaceous IPPs are intermixed with Small's milkpea and sand flax, control efforts must be designed to minimize the risk to non-target species. Various approaches and techniques will be considered when treating herbaceous IPPs intermixed with protected species, including techniques developed by IRC and used on other nearby populations.

4.1.1 Chemical Woody Invasive Pest Plants Control

Control of woody IPPs at HARB would be implemented on areas currently not actively landscaped, as feasible. Concentrated efforts to remove and control woody IPPs in the remnant pine rockland area and old grenade range would occur before IPP removal in other areas (Figure 1). Removal of woody IPPs in these areas would facilitate re-establishment of native pine rockland species and habitat. Over time, these areas would be used for relocating native pine rockland species from areas where disturbance would occur. Control of woody IPPs on the remainder of HARB would include a phased approach of elimination and removal of existing woody IPPs followed by continued treatments to control new growth from the persistent seedbank.

Initial control of woody IPPs would be accomplished through injection with an herbicide using a tree lance or hypodermic axe (hack and squirt) or through cut and stump paint with concentrated herbicide. The tree lance and hypodermic axe place the herbicide directly in the target plants with no risk of non-target contact, while cutting and stump painting minimizes the risk to non-target species. It is expected that triclopyr (due to its specific effectiveness on many woody plants) or glyphosate (due to its general effectiveness) would be used for the control efforts because each compound is readily available, but other appropriate herbicides would be considered. Once the woody vegetation dies, the standing material would be cut and removed from the site with stumps left in place.

Initial treatment would eliminate the mature woody IPPs and remove the seed source for these species. However, it is likely that woody herbaceous species would continue to grow on the site as a result of germination from the persistent seedbank and from the remaining root systems of the eliminated mature woody IPPs. In follow-on treatments, woody IPP seedlings or root sprouting would be treated the same as herbaceous IPPs, described below. Should any woody seedlings or root sprouts develop into saplings, they would be treated in the same manner as the original woody IPPs when observed. Eradication from HARB likely will not be possible due to the presence of off-installation seed sources in the area that are beyond HARB's control. However, IPP species can be controlled on HARB to minimize the impact on protected plant species. Effective control will likely take several years, but the spread of these species on HARB would be curtailed by the initial treatment.

4.1.2 Chemical Control of Herbaceous Invasive Pest Plants

Chemical control of herbaceous IPPs would primarily be focused to the remnant pine rockland area and the old grenade range in an effort to restore these areas to pine rockland habitats.

IPP treatment at HARB would focus on woody IPP species and herbaceous, tall grass IPP species such as Napier grass, bahia grass, and Burma reed that would attract foraging birds and increase potential aircraft strikes. Other IPP species would be treated, as appropriate, but such treatments would be prioritized based on relative threat. The exotic zoysia grass that occurs throughout HARB, especially around the airfield where it is not a bird attractant, would not be removed. Recent surveys found large populations of Small's milkpea growing within the zoysia grass and it does not appear to be adversely affecting the species where they co-occur. Small's milkpea was the only protected plant observed co-existing in large populations with the zoysia grass [IRC and URS, 2013 (Appendix A)]. Where pine rockland restoration would be implemented (remnant pine rockland area and old grenade range), Zoysia grass would be controlled because it could potentially outcompete other pine rockland species.

Where IPPs and protected species do not co-occur, IPP areas would be treated with broadcast foliar applications of Armed Forces Pest Management Board (AFPMB) approved herbicides and pesticides for DoD components and agencies (Appendix C). The chemical selected for application would have demonstrated effectiveness against the target species. Treatments would be applied under conditions when there is little to no potential for wind drift to transport broadcast foliar chemicals to non-treatment areas and when there is no immediate forecast for rain, which could wash active chemicals away before they were taken into the plants. Treatments would be repeated over time, as needed.

Where herbaceous IPPs co-occur with protected species, chemical treatment may not be viable. A monocot-selective herbicide with active ingredient Fluazifop may be used on grass species that respond to this type of treatment. Dicot-selective herbicides with Trichlopyr, 2,4-D and clopyralid active ingredients would be most effective for controlling these species (ex: Garlon 4 Ultra, Appendix C). Herbicides containing glyphosate may be used for general, non-selective control (ex: Roundup Pro and Rodeo, Appendix C). Broad-leaved IPPs would be controlled through directed foliar applications rather than broadcast spraying of herbicides to minimize the potential for non-target exposure and wind drift. Herbicides would be mixed with an approved surfactant when applying in and around aquatic habitats. The treatments would be repeated as necessary to achieve control.

Currently, a monocot-selective herbicide is not included on the AFPMB approved pesticide list. In the event a monocot-selective herbicide, preferably with active ingredient Fluazifop, is needed for management actions at HARB, the appropriate approval process will be followed. Use of a non-approved herbicide or pesticide requires completion and submittal of a "Request for Approval of Non-Standard Pesticide" AFCEC Non-Standard Approval Form 20140101. The request is reviewed by the Major Air Command entomologist and the USAF subject matter experts. Once approved, the pesticide is added to the AFPMB approved list and is available for use at DoD installations.

Prior to use of chemical treatment in the two potential restoration areas, where protected plant species may occur, seeds of Small's milkpea and sand flax would be collected from the treatment area, if available, to allow for reseeding following treatment of the area. This would maintain the genetic diversity present in the treatment area in the event of unintentional non-target impacts.

4.2 Mowing

The mowing and weed whacking regime at HARB has functioned as a surrogate for periodic fires, normally a necessary disturbance for the pine rockland community. Mowing and weed whacking have aided Small's milkpea and sand flax to persist and thrive at HARB, despite the highly altered system. Mowing and weed whacking will continue at the current frequencies. However, the weed whacking would be raised to 15 centimeters (cm) above the ground to potentially increase the benefit to the sand flax, particularly along canal and ditch banks. Preliminary data from other studies suggest that cutting sand flax too low (2 cm) can kill the plant [IRC and URS, 2013 (Appendix A)].

4.3 Native Pine and Grass Propagation

Planting of native pine and grasses would occur only in the remnant pine rockland area and old grenade range, where restoration to pine rockland habitat would be implemented. Planting of native pine and grasses throughout the installation is not feasible with military airfield operations, which require mowed and maintained vegetation to reduce the occurrence of nesting and foraging by birds to minimize the potential aircraft collision hazard.

Within the remnant pine rockland area and old grenade range, scattered plantings of native pine would be made in an effort to restore pine to the habitat. In a year following woody IPP removal, South Florida slash pine (*Pinus elliottii* var. *densa*) seedlings would be planted at a density of 35 seedlings per acres, with the goal of establishing an open pine community canopy typical of the pine rockland community. The pines would be planted in areas where exotic woody vegetation was removed and other areas where Small's milkpea and sand flax do not occur to avoid accidental impacts to these protected species.

It is expected that 250 seedlings would be purchased from the Florida Division of Forestry Andrews Nursery, or a similar native plant supplier, to assure that local genotypes are obtained. If a supplier other than the Florida Division of Forestry Andrews Nursery is selected, the supplying nursery must certify that all seedlings are *Pinus elliottii* var. *densa*.

When the planted pines are well-established, a second planting would be done to start uneven-aged stand conditions. The second planting would be scheduled 10 – 13 years following the initial pine planting. After the second planting, additional plantings would not be planned, as natural recruitment should continue development of an uneven-aged

canopy with a cover of approximately 25 percent. No pine planting would occur in areas outside of the remnant pine rockland area and old grenade range.

Based on experience with other restoration areas in Miami-Dade County, the Miami-Dade County Department of Environmental Resources Management recommends allowing natural colonization of native grasses for small restoration areas with a nearby source of native seeds. Therefore, planting of native grasses may not be included in the management strategy. Should it be determined that native recolonization is not sufficient to re-establish native grasses, mature seeds would be collected and broadcast over these areas without pre-treatment. If native grass overseeding were to become necessary, it would be done in the interval between the pine plantings.

4.4 Seed Collection/Distribution

If mature seeds are available prior to disturbing an area containing Small's milkpea or sand flax, seeds would be collected prior to the disturbance. Collected seeds would be scattered in adjacent, undisturbed areas or within the remnant pine rockland area or old grenade range once these areas are established as pine rockland management areas.

While the USAF does not have resources to fund such activities, HARB would consider cooperating with other agencies or organizations that wish to conduct research on the populations of Small's milkpea and sand flax occurring on the property. Within mission limitations, the USAF would provide reasonable access to the site, provided advance notice is received and current security policies are followed, to qualified personnel for research, collection, study, compliance monitoring, or mitigation monitoring of Small's milkpea or sand flax. Such cooperation could include allowing access to:

- Collect seeds to support restoration efforts in Miami-Dade County.
- Conduct ecological or genetic population studies.
- Conduct manipulative investigations where USFWS determines in advance that the proposed study is feasible and would not jeopardize the existence of Small's milkpea and sand flax.

4.5 Adaptive Management

The results from certain components of this plan cannot be accurately predicted. For example, treatment for exotic species may exhibit variable success and recolonization rates by controlled species may not be consistent. Therefore, intervals and intensities of treatments may vary over time, resulting in more or less effort in a given year compared to the plan. Because the intent of the plan is to benefit the species and not to rigidly adhere to the plan details, managers would make adjustments for periods of lesser or greater effort as conditions warrant.

Chapter 5 Evaluation and Reporting

Annual monitoring and maintenance activities for protected plant species would be recorded, and the documentation would be submitted in accordance with reporting requirements of the INRMP. Information reported would include discussion of:

- The status of protected species
- The efficacy of management actions implemented
- Trend data on species populations
- Information on whether the management approach needs to be modified moving forward

Protected species within the two restoration areas (remnant pine rockland area and old grenade range) would be monitored on a yearly basis. The remainder of HARB would be monitored for protected species on a 3-year rotation, as described in Table 5-1.

5.1 Monitoring

5.1.1 Small's Milkpea, Sand Flax, and Others

Federal and state listed species would be monitored annually in the restoration areas (remnant pine rockland area and old grenade range) once restoration is in progress. The remnant pine rockland area would be monitored beginning in 2015. Monitoring in the old grenade range would begin after IPP species are under control. Specific monitoring protocols would be determined as management in each area is implemented. Management actions would be assessed for efficacy in coordination with the USFWS and other cooperating agencies.

Outside of the two restoration areas, known occurrences of Small's milkpea and sand flax would be monitored on a 3-year rotation, as listed in Table 5-1 and depicted in Figure 1. These populations would be monitored following the same methods used in the 2013 survey [IRC and URS, 2013 (Appendix A)]. This monitoring would be expanded to include state listed species, once specific occurrences are documented.

TABLE 5-1
HARB Three-year Rotation Monitoring Program
HARB Protected Plant Management Plan

Area	Years Monitored
Northeast Grasslands	2014 and 2017
Munitions Area	2014 and 2017
Grenade Range and Reserves Area	2014 and 2017
Administrative and Industrial Support	2015 and 2018
Operable Unit 2	2015 and 2018
Southwest Clear Zone	2016 and 2019
Airfield	2016 and 2019

5.1.2 IPP Species

The IPP removal actions are ongoing within the remnant pine rockland area and, as a result, IPPs are under reasonable control in this area. With continued control efforts, the remnant pine rockland area is expected to be re-established to near natural condition within a few years. The old grenade range, however, is severely overrun with IPP species and no control measures have been implemented in this area to date. Several years of control efforts to remove woody and herbaceous IPP species and clear the ground of accumulated duff from IPP would be required to allow native species to recolonize this area.

Once the remnant pine rockland area and old grenade range are established as pine rockland restoration areas, IPP species would be observed and monitored using pre-determined methods. Monitoring protocols would also document the relative effectiveness of treatments applied since the previous monitoring period and would identify any needs for future management efforts. Areas with an immediate need for treatment based upon perceived threat to Small's milkpea or sand flax would be noted.

IPP monitoring at HARB outside the management areas would focus on woody IPP species and herbaceous, tall grass IPP species such as Napier grass, bahia grass, and Burma reed that would attract foraging birds and increase the potential for aircraft strikes.

5.1.3 Pine Rockland Habitat

Once the remnant pine rockland area and old grenade range are established as pine rockland restoration areas, observations would be made regarding the general quality of the habitat. Observations on survival, health, and vigor of naturally occurring pine rockland species and planted native pine and grasses would be recorded. The crown cover of pines would be estimated. In addition, observations on natural recruitment of other woody species common to pine rockland habitat would be made.

No other areas on HARB provide conditions where intact pine rockland habitat can be established. Therefore, no observations on pine rockland habitat would be recorded outside of the restoration areas.

5.2 Reporting

Activities for the PPMP would be documented in the annual INRMP report, as the PPMP will be a component of the INRMP. The PPMP-specific sections of the INRMP report will include separate discussions of the remnant pine rockland area, old grenade range, and the other areas monitored on a 3-year rotational basis. The PPMP section of the annual INRMP report will also include:

- Project background and history, including prior management efforts
- Management activities implemented since the previous report
- Population estimates for Small's milkpea and sand flax from the monitoring period, by population
- Trend data for Small's milkpea and sand flax, by population
- Status assessment of Small's milkpea and sand flax populations

- Assessment of efficacy of management efforts, to include:
  - Woody IPP control
  - Herbaceous IPP control
  - Pine rockland habitat enhancements
- Identification of future management needs

Chapter 6 Estimated Management Costs

Management and monitoring would be performed by a reputable company with biologists knowledgeable of pine rockland species and native pine rockland habitat.

The initial general management costs to include the removal of woody IPPs and other non-woody IPPs in the remnant pine rockland area and old grenade range are estimated to be:

- $15,000 per acre for woody IPP removal; includes use of a subcontractor with heavy equipment, such as a boom crane, to remove large woody debris without disturbance to the underlying oolite-soil complex
- $3,750 per acre for non-woody IPP control
- $500 per acre for duff removal
- $100 per acre for chemicals
- Vehicle use charge of $3,500

The general annual management costs following the initial IPP removal are estimated at:

- $2,500 per acre
- $1,500 per acre for chemicals
- $2,000 vehicle use charge

The estimated cost to monitor Small's milkpea, sand flax, and state listed species, including population counts and mapping, at HARB as described in Section 5 is approximately $300 per acre.

Detailed management costs for each year are presented in Table 6-1 below.

TABLE 6-1
Management and Monitoring Costs for Protected Plant Monitoring and Maintenance: 2015-2019
HARB Protected Plant Management Plan

Year	Areas Included	Activity	Management Costs	Monitoring Costs	Total Costs
2015	Remnant Pine Rockland	Initial removal of woody and herbaceous IPP and general monitoring	$99,635	$1,500	$101,135
	Old Grenade Range	Initial removal of woody and herbaceous IPP and duff removal	$197,210	$0	$195,210
2016	Remnant Pine Rockland	General annual management and general monitoring	$22,500	$1,500	$24,000
	Old Grenade Range	General annual management and general monitoring	$42,755	$3,050	$45,805
2017	Remnant Pine Rockland	General annual management and general monitoring	$22,500	$1,500	$24,000
	Old Grenade Range	General annual management and general monitoring	$42,755	$3,050	$45,805
2018	Remnant Pine Rockland	General annual management and general monitoring	$22,500	$1,500	$24,000
	Old Grenade Range	General annual management and general monitoring	$42,755	$3,050	$45,805
2019	Remnant Pine Rockland	General annual management and general monitoring	$22,500	$1,500	$24,000
	Old Grenade Range	General annual management and general monitoring	$42,755	$3,050	$45,805

Chapter 7 References

Austin, D. F. 1997. Pine Rockland Plant Guide: A Field Guide to the Plants of South Florida's Pine Rockland Community. Department of Environmental Resource Management, Environmentally Endangered Lands, Miami-Dade County, Florida.

Bradley, K. A. and G. D. Gann. 1999. Status Summaries of 12 Rockland Plant Taxa in Southern Florida. October 27, 1999.

Bradley, K., and J. Possley. 2002. Conservation Action Plan for *Galactia smallii*. In Maschinski, J., M.Q.N. Fellows, J. Fisher, C. Lane, M. Fidelibus, S. Wright, P. Anderson, G. Guala, J. Pipoly, and J. Possley. Conservation of south Florida endangered and threatened flora: Final Report to the Endangered Plant Advisory Council, FDACS Contract #006466. Florida Department of Agriculture and Consumer Services, Division of Plant Industry, Gainesville, Florida.

Engineering-Environmental Management, Inc. (EEM). 2005. Invasive and Nonnative Species Survey and Management Plan for Homestead Air Reserve Base, Homestead, Florida. June 2005.

Flora of North America (FNA). 2008. Chaptalia albicans. http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=250066329, accessed October 4, 2013.

Florida Natural Areas Inventory (FNAI). 2000a. Sand Flax. http://www.fnai.org/trackinglist.cfm, accessed October 1, 2013.

Florida Natural Areas Inventory (FNAI). 2000b. Wild Potato Morning-Glory. http://www.fnai.org/trackinglist.cfm, accessed October 1, 2013.

Florida Natural Areas Inventory (FNAI). 2000c. Beach Jacquemontia. http://www.fnai.org/trackinglist.cfm, accessed October 1, 2013.

Florida Natural Areas Inventory (FNAI). 2000d. Pineland Lantana. http://www.fnai.org/trackinglist.cfm, accessed October 1, 2013.

Florida Natural Areas Inventory (FNAI). 2000e. Wedgelet Fern. http://www.fnai.org/trackinglist.cfm, accessed October 1, 2013.

Florida Natural Areas Inventory (FNAI). 2000f. Long-stalked Stopper. http://www.fnai.org/trackinglist.cfm, accessed October 1, 2013.

Florida Natural Areas Inventory (FNAI). 2000g. Everglades Pencil-Flower. http://www.fnai.org/trackinglist.cfm, accessed October 1, 2013.

Florida Natural Areas Inventory and Florida Department of Natural Resources (FNAI and FDNR). 1990. Guide to the Natural Communities of Florida. February 1990.

Golder Associates Inc. 2012. Homestead Air Reserve Base Pine Rockland Baseline Assessment Report. September 2012.

Hammer, R.L. 2002. Everglades Wildflowers. A Falcon Guide, The Globe Pequot Press. 243pp.

Homestead Air Reserve Base (HARB). 2009. Integrated Natural Resources Management Plan for Homestead Air Reserve Base, Homestead, Florida.

Institute for Regional Conservation (IRC). 2009a. Assessment of Rare Plant Species and Pine Rockland Habitat at Proposed U.S. Army Special Operations Command South Headquarters Adjacent to the U.S. Air Reserve Base, Homestead, Florida. July 2009.

Institute for Regional Conservation (IRC). 2009b. Addendum: Assessment of Rare Plant Species and Pine Rockland Habitat at Proposed U.S. Army Special Operations Command South Headquarters Adjacent to the U.S. Air Reserve Base, Homestead, Florida. November 2009.

Institute for Regional Conservation (IRC). 2013. Plant Survey for the Endangered Small's Milkpea (*Galactia smallii*) and Candidate Sand Flax (*Linum arenicola*) Dade County Florida, Adjacent to SOCSOUTH Headquarters Homestead, Florida. October 2013.

Institute for Regional Conservation and URS Group, Inc. (IRC and URS). 2013. Assessment of The Federally Endangered Small's Milkpea (*Galactia smallii*) and Candidate Sand Flax (*Linum arenicola*) at The Homestead Air Reserve Base, Homestead, Florida. November 2013.

Nelson, G. 1996. The Shrubs and Woody Vines of Florida. Pineapple Press. 391pp.

Nelson, G. 2000. The Ferns of Florida. Pineapple Press. 208pp.

Nelson, G. 2005. East Gulf Coastal Plain Wildflowers. The Globe Pequot Press. 264pp.

U.S. Fish and Wildlife Service (USFWS). 1999. Small's Milkpea, Galactia smallii H.J. Rogers ex Herndon. Multi-species Recovery Plan for South Florida.

Wunderlin, R.P. and B.F. Hansen. 2011. Guide to the Vascular Plants of Florida, third edition. University Press of Florida. 783 pp.

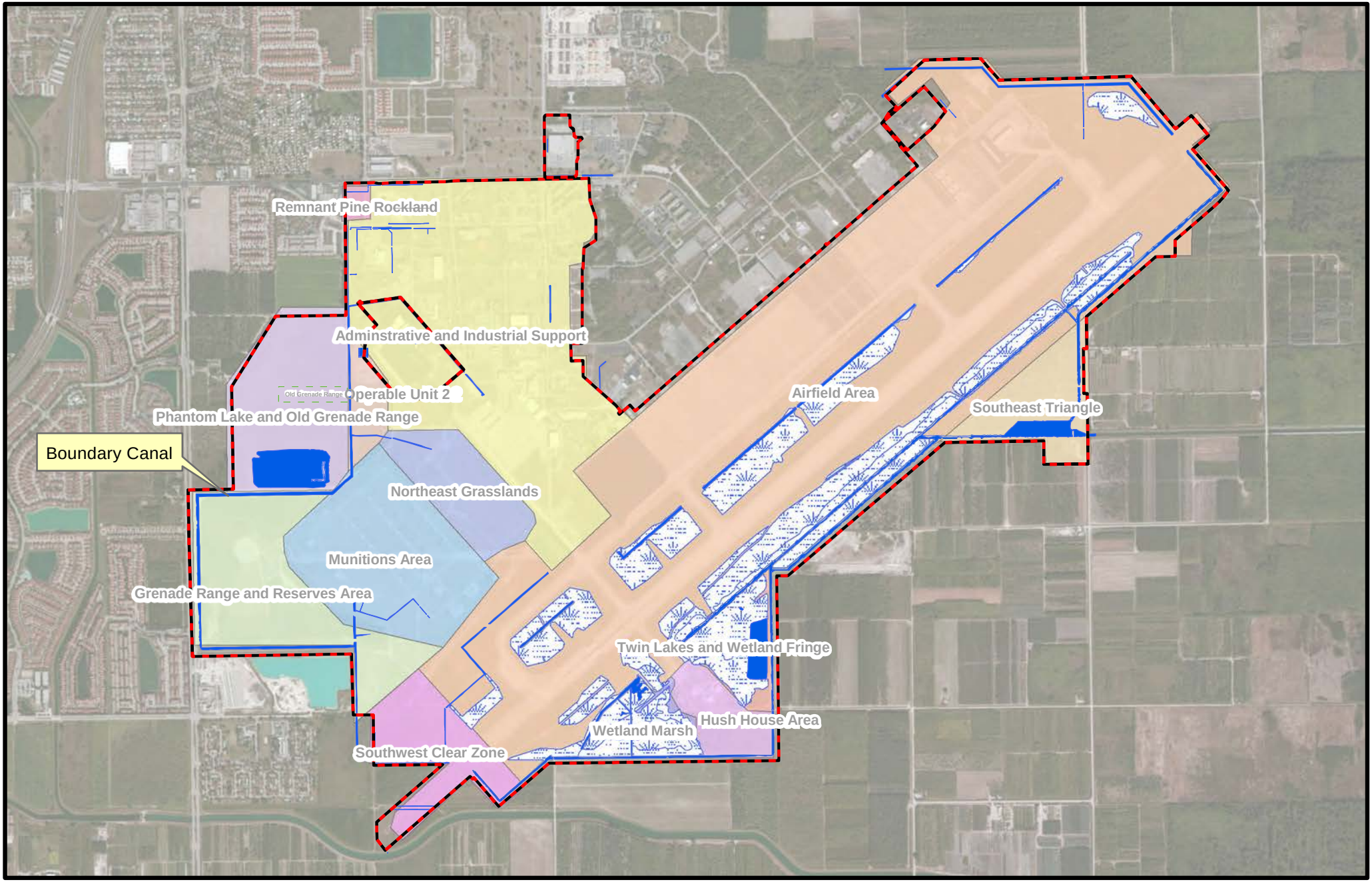


Figure 1
HARB Land Use Management Areas
Protected Plant Management Plan
Homestead Air Reserve Base, Florida

Legend

Location Polygons

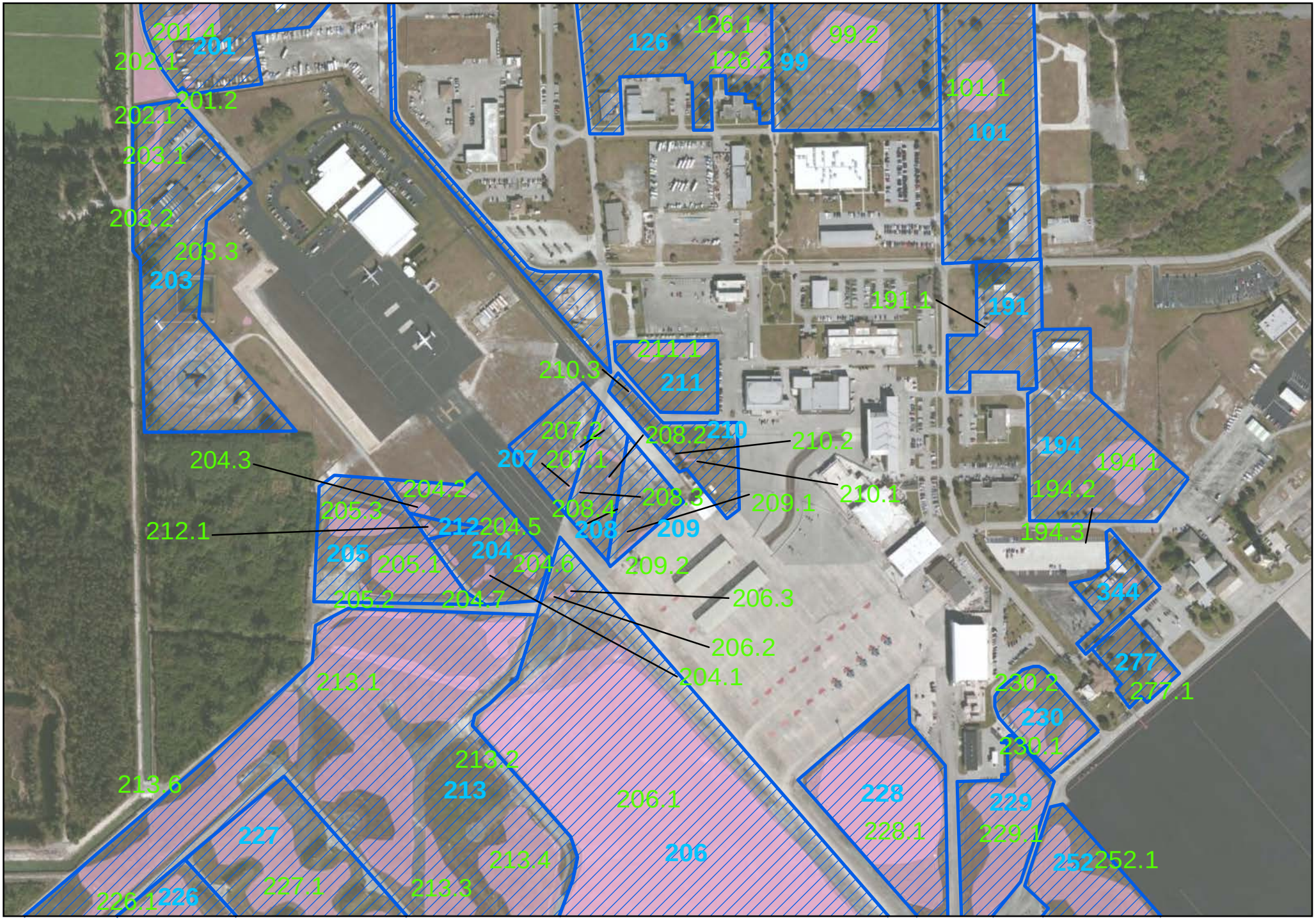
Galactia Smallii and Linum Arenicola Populations

0 125 250 500 Feet

N

Figure 2

Small's milkpea and sand flax populations
Protected Plant Management Plan
Homestead Air Reserve Base, Florida



Legend

Location Polygons

Galactia Smallii and Linum Arenicola Populations

0 125 250 500 Feet

N

Figure 3
Small's milkpea and sand flax populations
Protected Plant Management Plan
Homestead Air Reserve Base, Florida

Legend

Location Polygons

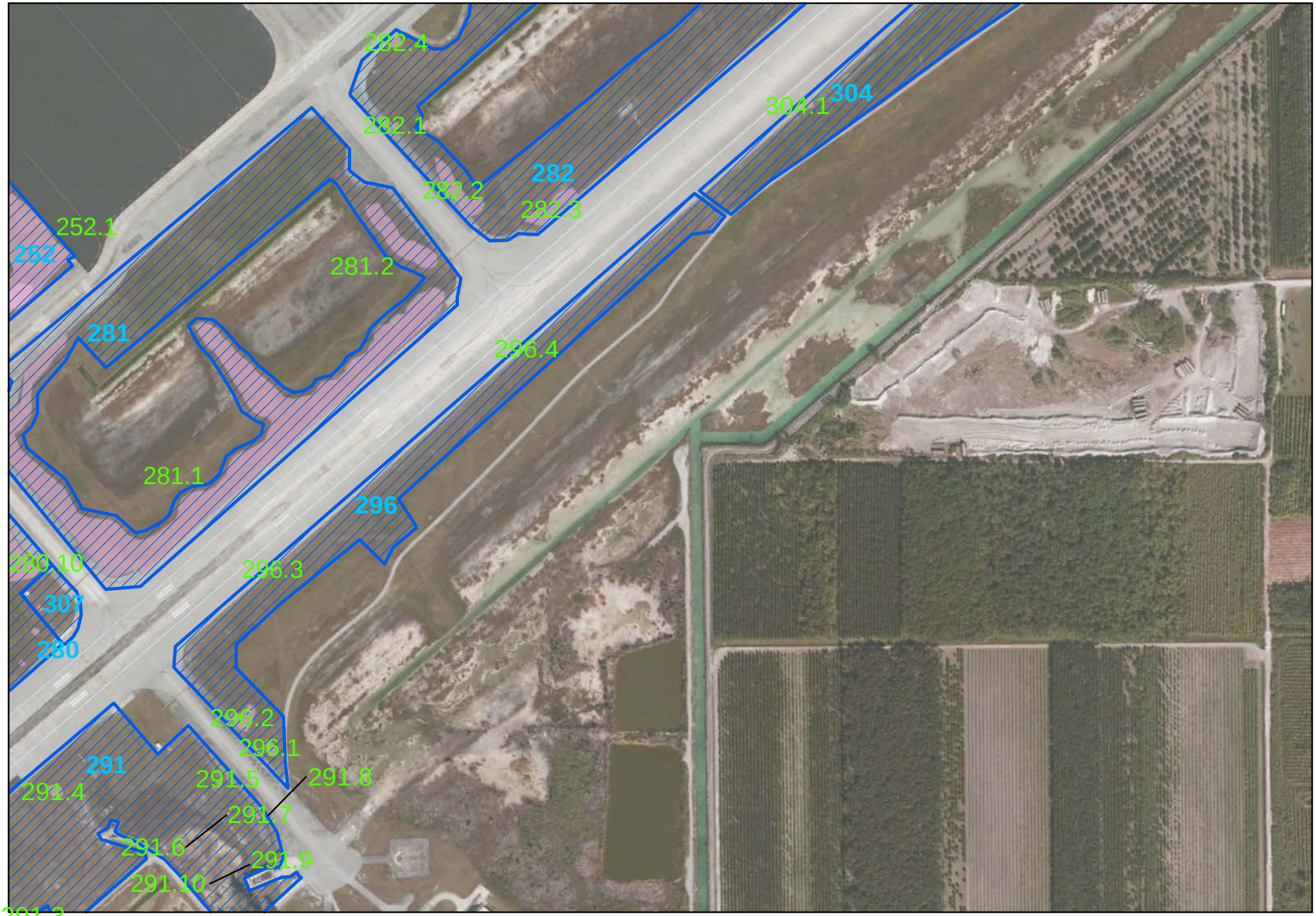
Galactia Smallii and Linum Arenicola Populations

0 125 250 500 Feet

N

Figure 4

Small's milkpea and sand flax populations
Protected Plant Management Plan
Homestead Air Reserve Base, Florida



Legend

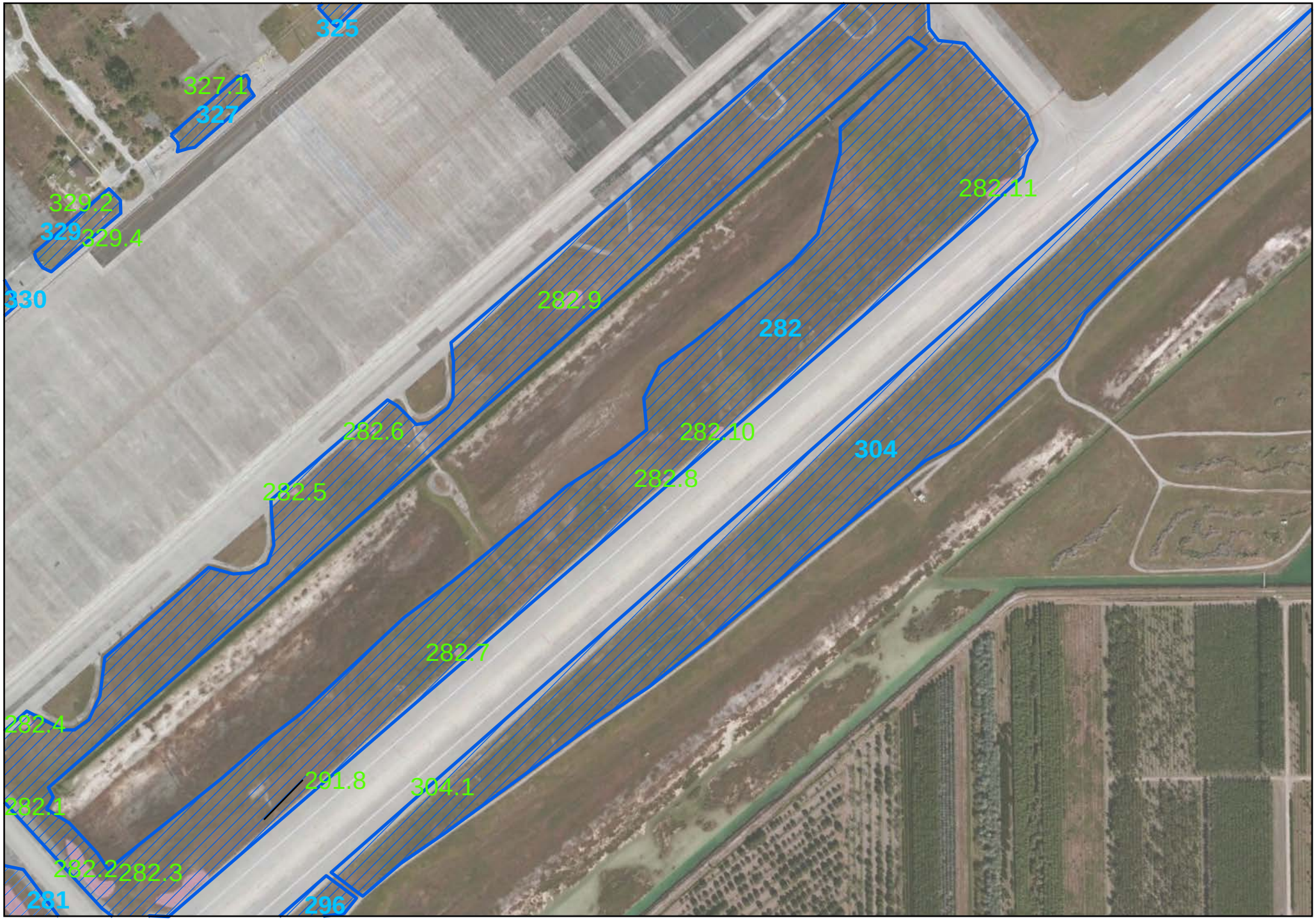
Location Polygons

Galactia Smallii and Linum Arenicola Populations

0 125 250 500 Feet

N

Figure 5
Small's milkpea and sand flax populations
Protected Plant Management Plan
Homestead Air Reserve Base, Florida



Legend

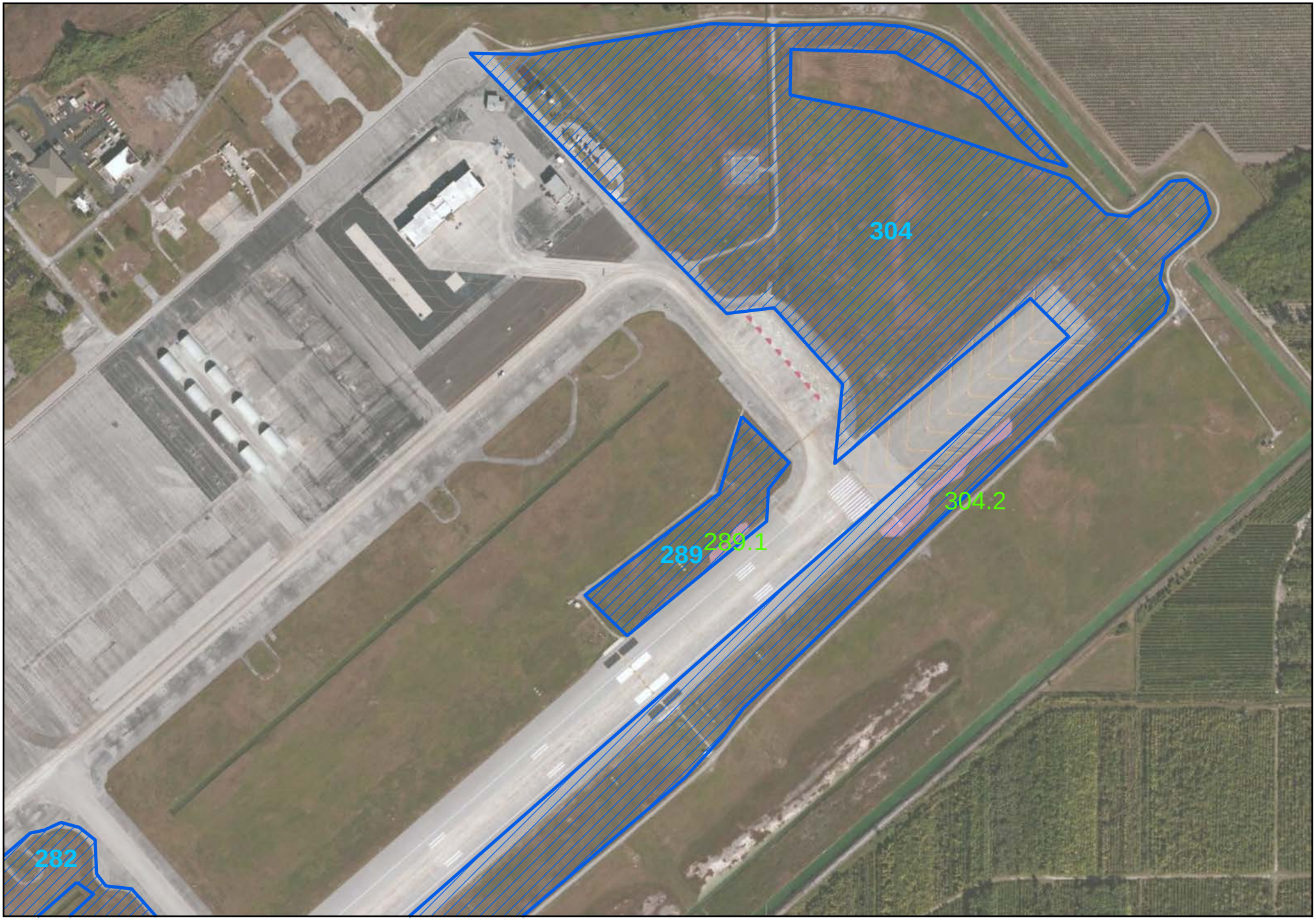
Location Polygons

Galactia Smallii and Linum Arenicola Populations

0 125 250 500 Feet

N

Figure 6
Small's milkpea and sand flax populations
Protected Plant Management Plan
Homestead Air Reserve Base, Florida



Legend

Location Polygons

Galactia Smallii and Linum Arenicola Populations

0 125 250 500 Feet

N

Figure 7
Small's milkpea and sand flax populations
Protected Plant Management Plan
Homestead Air Reserve Base, Florida

Legend

Location Polygons

Galactia Smallii and Linum Arenicola Populations

0 125 250 500 Feet

N

Figure 8

Small's milkpea and sand flax populations
Protected Plant Management Plan
Homestead Air Reserve Base, Florida

Legend

Location Polygons

Galactia Smallii and Linum Arenicola Populations

0 125 250 500 Feet

N

Figure 9

Small's milkpea and sand flax populations
Protected Plant Management Plan
Homestead Air Reserve Base, Florida

Appendix A

Assessment of the Federally Endangered Small's Milkpea (*Galactia smallii*) and Candidate Sand Flax (*Linum arenicola*) at Homestead Air Reserve Base Report by The Institute for Regional Conservation (IRC)

Assessment of The Federally Endangered Small's Milkpea (*Galactia smallii*) and Candidate Sand Flax (*Linum arenicola*) at The Homestead Air Reserve Base, Homestead, Florida

Project 22242965.56520.03000

Contract W91278-11-D-0054

Task Order No. 0003

Craig van der Heiden and James Johnson

November 21, 2013

Submitted by:
The Institute for Regional Conservation
100 E. Linton Blvd, Suite 302B
Delray Beach, Florida 33483
And
URS Group, Inc.
Denver, Colorado 80237

Submitted to:
U.S. Army Corps of Engineers, Mobile District
Attn: Mr. Brian Peck (CESAM-PD-M)
Mobile, Alabama 36628-0001

Table of Contents

List of Acronyms andAbbreviations

HARB	Homestead Air Reserve Base
HAFB	Homestead Air Force Base
ESA	Endangered Species Act
SE	Standard Error
SD	Standard Deviation
FID	Feature Identification
ESRI	Environmental Systems Research Institute
PVC	Polyvinyl Chloride
m	Meter(s)
m^2	Square Meter(s)
cm	Centimeter(s)

List of Tables

List of Figures

Introduction

The Homestead Air Reserve Base (HARB) is located in Miami-Dade County in southern Florida. The cantonment covers approximately 1,953 acres and is surrounded by agricultural lands to the northeast, east and south and by residential housing developments to the northwest and west of HARB.

Pine rocklands once dominated south Florida's coastal ridge. Pine rocklands are savanna-like forests dominated by a single canopy tree, slash pine (*Pinus elliottii*), with a diverse hardwood and palm subcanopy. A rich herbaceous layer contains many endemic species. The pine rockland habitat is considered a fire climax community. Fire helps maintains pine rockland plant communities by controlling the amount of vertical structure, invasion and growth of hardwoods, species composition, and allows light to reach the understory and herbaceous plants. Anthropogenic habitat destruction has resulted in the loss of much of this habitat leaving only remnant patches of habitat making it one of the rarest habitats in the world.

In Miami-Dade County, the pine rocklands are associated with the Miami Rock Ridge, a formation of oolitic limestone. Pine rocklands occur on relatively flat limestone rock that is at or near the surface. Soils often accumulate in depressions and rock cavities and consist of sand, marl, and organic material.

The HAFB (Homestead Air Force Base) was built on the Miami Rock Ridge. The HARB (a portion of the original HAFB) contains some areas of the existing pine rockland fragments that could have populations of federally endangered species. The survey of the HARB cantonment area revealing the presence of two rare plant species, Small's milkpea (*Galactia smallii*) which is listed as endangered under the Endangered Species Act (ESA), and sand flax (*Linum arenicola*) which is a candidate for listing under the ESA. These species were found in many parts of HARB, at varying densities. The two species were growing in relictual pine rockland habitats that had formerly been cleared for the construction of the air base.

Methods

The scope of this project was to perform a baseline assessment of the Federally endangered Small's milkpea and federal candidate sand flax on the approximately 1000 acres of modified pine rockland habitat at the time of the study. The boundaries and polygons for HARB were obtained as ESRI ArcMap shape files from Christopher Mareska, GIS specialist. Polygons were numbered according to their feature identification (FID), which were created and labeled within ArcMap prior to obtaining the shapefiles and were used as references for our survey areas. The polygons are used solely for reference purposes which will enable land managers to find the areas were populations of Small's milkpea and sand flax are located. The entire parcel was walked to determine suitable habitat and to identify population locations.

Following the initial surveys to determine where the populations of Small's milkpea and sand flax were located, we returned to HARB to quantify the densities of the different populations. In

areas where the populations were small (less than 10 meters (m) x 10 m), randomly placed 1 m x 1 m portable plots made of polyvinyl chloride (PVC) were utilized within the population of plants to determine population size. In larger areas (greater than or equal to 10 m x 10 m), each species was quantified (Small's milkpea and sand flax) using randomly placed belt transects 1 m x 10 m up to 1 m x 50 m. Estimates of total population densities were derived from these data.

The quality of habitat for each of the polygons where either Small's milkpea and/or sand flax were found was determined. Habitat quality was recorded as poor, medium, or high. This was a qualitative assessment based on previous experience The Institution for Regional Conservation has had from working in various pine rockland ecosystems. Factors that were considered in assessing habitat quality were dominance of pine rockland plant species versus exotic or native weedy plant species (indicating a degraded natural habitat) and diversity of pine rockland plant species. The three habitat classes are defined as follows:

- Poor quality habitat: dominated by the exotic grasses St. Augustine grass (*Stenotaphrum secundatum*) and Mascarene templegrass (*Zoysia tenuifolia*), which were originally planted as turf grasses on the base.
- Medium quality habitat: low dominance of pine rockland species with native weedy plants and smaller amounts of exotic grasses (St. Augustine and Mascarene templegrass)
- High quality habitat: high dominance of endemic pine rockland species and other native species, lacking exotic grasses.

It should, however, be noted that Small's milkpea is often found growing in high densities within areas dominated by the exotic grass Mascarene templegrass. As this is an exotic grass species, this habitat is recorded as poor despite high densities of Small's milkpea. These turf grasses are exotic grasses which do not occur naturally within pine rockland ecosystems, and have an overall negative effect on the quality of the habitat.

Populations of Small's milkpea and sand flax, within the larger polygons, were created from data generated during the initial surveys and density quantifications. A trace density of either Small's milkpea and sand flax was determined when a species found during initial surveys was not found when quantifying the plants. In one instance where Small's milkpea was found in the initial survey, we returned to find the entire area freshly re-sodded with St. Augustine grass. Sand flax is a small thin plant, which can be very difficult to locate without its flower, therefore even though it may have been found during the initial survey, re-locating the plant may not be possible in all instances (especially in areas of very low abundance).

Results

During the surveys no other species considered as Endangered, Threatened, or Candidates by the United States Fish and Wildlife Service were found other than Small's milkpea and sand flax. A total of 24 species listed by the State of Florida Department of Agriculture and Consumer Services as Endangered, Threatened, or Commercially Exploited were found on the property (Table 1). These species are typical components of pine rocklands throughout southern Florida. Lists of all other native and exotic species (Table 2 and 3 respectively) are provided as a reference for species mentioned in the results section of this report. The United States Department of Agriculture was referenced for plant listings.

Table 1: State-listed Endangered, Threatened, and Commercially Exploited Plant Species found on Homestead Air Reserve Base.

Scientific Name	**Common Name**	**Listing**
Angadenia berteroi	Pineland golden trumpet	Threatened
Bletia purpurea	Pinepink	Threatened
Byrsonima lucida	Locust berry	Threatened
Chaptalia albicans	White sunbonnets	Threatened
Coccothrinax argentata	Florida silver palm	Threatened
Crossopetalum ilicifolium	Quail berry	Threatened
Cynanchum blodgettii	Blodgett's swallowwort	Threatened
Galactia Smallii	Small's milkpea	Endangered
Ipomoea microdactyla	Man-in-the-ground	Endangered
Jacquemontia curtisii	Pineland cluster vine	Threatened
Lantana depressa	Rockland shrub verbena	Endangered
Linum arenicola	Sand flax	Endangered
Melanthera parvifolia	Pineland black anthers	Threatened
Odontosoria clavata	Wedgelet fern	Endangered
Phyla stoechadifolia	Southern fogfruit	Endangered
Psidium longipes	Long stalked stopper	Threatened
Pteris bahamensis	Bahama ladder brake	Threatened
Rhynchosia parvifolia	Small-leaf snoutbean	Threatened
Scutellaria havanensis	Havana scullcap	Endangered
Selaginella armata var. eatonii	Eaton’s spike-moss	Endangered
Senna mexicana var. chapmanii	Bahama senna	Threatened
Smilax havanensis	Everglades greenbrier	Threatened
Spermacoce terminalis	Everglades false buttonweed	Threatened
Stylosanthes calcicola	Everglades key pencilflower	Endangered
Tetrazygia bicolor	West Indian-lilac	Threatened

Table 2: List of common native species encountered

Scientific Name	**Common Name**	**Listing**
Acalypha chamaedrifolia	Three-seeded mercury	Native
Andropogon longiberbi	Hairy bluestem	Native
Anemia adiantifolia	Pine fern	Native
Aristida purpurascens	Arrowfeather threeawn	Native
Bidens alba var. *radiata*	Spanish-needles	Native
Centrosema virginianum	Spurred butterfly-pea	Native
Crotolaria pumila	Low rattlebox	Native
Dyschoriste angusta	Rockland twinflower	Native
Eragrostis elliottii	Elliott's love grass	Native
Ernodea littoralis	Beach-creeper	Native
Eustachys petraea	Common fingergrass	Native
Flaveria linearis	Narrowleaf yellowtops	Native
Galactia volubilis	Downy milkpea	Native
Heliotropium polyphyllum	Pineland heliotrope	Native
Indigofera miniata var. *florida*	Florida coastal indigo	Native
Morinda royoc	Yellowroot	Native
Muhlenbergia capillaris	Muhlygrass	Native
Paspalum caespitosum	Blue paspalum	Native
Paspalum setaceum	Thin paspalum	Native
Phyla nodiflora	Frogfruit	Native
Phyllanthus pentaphyllus var. floridanus	Florida five-petalled leafflower	Native
Rhynchospora colorata	Starrush whitetop	Native
Rhynchospora floridensis	Florida whitetop	Native
Schizachyrium gracile	Wire bluestem	Native
Schizachyrium rhizomatum	Rhizomatous bluestem	Native
Schizachyrium sanguineum	Crimson bluestem	Native
Setaria parviflora	Knotroot foxtail	Native
Sida acuta	Common wireweed	Native
Stachytarpheta jamaicensis	Blue porterweed	Native
Vernonia blodgettii	Florida ironweed	Native
Vigna luteola	Cow-pea	Native

Table 3: List of common exotic species encountered

Scientific Name	Common Name	Listing
Casuarina equisetifolia	Australian pine	Exotic
Eremochloa ophiuroides	Centipede grass	Exotic
Fimbristylis cymosa	Hurricane sedge	Exotic
Paspalum notatum	Bahiagrass	Exotic
Pteris vittata	China brake	Exotic
Schinus terebinthifolius	Brazilian peppertree	Exotic
Stenotaphrum secundatum	St. Augustine grass	Exotic
Wedelia trilobata	Creeping wedelia	Exotic
Zoysia tenuifolia	Mascarene templegrass	Exotic

A total of 56 populations of Small's milkpea were mapped and quantified. Small's milkpea was found in varying quantities throughout the base with the lowest average density of 0.008/ square meter (m^2) and highest density of 3.12/ m^2. The average density is 0.379 ± 0.051 standard error (SE)/m^2. The total population on HARB is estimated at 404,779±7,442 standard deviation (SD).

Fewer populations of sand flax were found on HARB. Nineteen populations were found with varying average densities; the lowest density 0.006/ m^2 and the highest 2.0/ m^2. The average density of sand flax is 0.213 ± 0.058 (SE)/m^2. The population estimate for sand flax on HARB is estimated at 31,399±2,271 (SD) plants.

Reference polygons with FID numbers are highlighted in beige (Figures 2-9) and only polygons containing small's milkpea and sand flax are discussed in the results. Within each polygon, Small's milkpea and sand flax populations are outlined, numbered, and shaded purple for Small's milkpea and yellow for sand flax. Habitat descriptions are describing entire Polygons and are not specific to individual populations unless otherwise stated.

Polygon 0. (Figure 2) *Area: 14.3 acres* Small's milkpea: 3,132 sand flax: 3,985

Habitat description: Medium quality habitat along the northern and western boundary. The interior of the polygon contains some small populations of Small's milkpea. Polygon 0 has native grasses (*Schizachyrium sanguineum, Paspalum caespitosum*) intermingled with Mascarene templegrass. Other native species associated with this polygon are *Stylosanthes calcicola, Jacquemontia curtisii, Psidium longipes, Scutellaria havanensis, Spermacoce terminalis, Tetrazygia bicolor*.
Management recommendations: continue mowing height and frequency; managing the height of weed whacking; spot treat Mascarene templegrass.

Figure 10.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
0	1.141	0.462	0.45	2,063
1	0.316	0.128	0.30	384
2	0.141	0.057	0.03	18
3	0.011	0.005	0.07	3
4	0.007	0.003	0.26	7
5	0.008	0.003	0.15	5
159	1.140	0.461	0.14	646
6	0.007	0.003	0.20	6
			Total	3,132

Figure 27.

sand flax **populations**				
0	1.13	0.458	0.75	3,439
30	1.18	0.481	0.11	545
			Total	3,985

Polygon 6. (Figure 2) *Area: 1.4 acres* Small's milkpea: 240 sand flax: Trace

Habitat description: A narrow band of medium quality habitat. Sand flax occurs as a trace in this polygon. Other plants found are St. Augustine, *Psidium longipes, Scutellaria havanensis, Smilax havanensis, Pteris bahamensis, Crossopetalum ilicifolium, Lantana depressa, Angadenia berteroi, Spermacoce terminalis*.
Management recommendations: Continue mowing frequency. St. Augustine is not yet growing within the populations of Small's milkpea and sand flax and should therefore be kept from encroaching into the areas containing Small's milkpea and sand flax.

Figure 10.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
7	0.148	0.060	0.40	240
			Total	240

Polygon 7. (Figure 2) *Area: 8.8 acres* Small's milkpea: 347 sand flax: 0

Habitat description: An area of poor quality habitat dominated by the exotic Mascarene templegrass, with two small populations of Small's milkpea and a larger population north of the tennis courts.
Management recommendations: Continue mowing height and frequency. Treat Mascarene templegrass.

Figure 11.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
15	0.119	0.048	0.09	43
16	0.295	0.119	0.25	298
17	0.016	0.006	0.08	5
			Total	347

Polygon 99. **(Figure 3)** *Area: 7.8 acres* Small's milkpea: 2,366 sand flax: 0

Habitat description: Area with poor quality habitat dominated by Mascarene templegrass. Population 22 was covered over with St. Augustine sod and no plants were found when quantifying the population.
Management recommendations: Continue mowing height and frequency. Prevent the spread of St. Augustine into the populations as there are large patches to the south and west of the Small's milkpea.

Figure 12.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
22	0.194	0.079		
23	1.193	0.483	0.49	2,366
			Total	2,366

Polygon 101. (Figure 3) *Area: 7.8 acres* Small's milkpea: 2,391 sand flax: 0

Habitat description: Medium quality habitat. Habitat dominated by Mascarene templegrass with some native grasses, *Schizachyrium sanguineum*, *Schizachyrium gracile* and *Paspalum* spp. The population has high densities of Small's milkpea. This polygon has the potential for expansion of the Small's milkpea population throughout the area. Although the extent of population was 0.5 acres it could expand throughout this polygon. Other species found are *Anemia adiantifolia*, *Chaptalia albicans*.
Management recommendations: Continue mowing height and frequency. Treat exotic grasses.

Figure 12.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
24	0.568	0.230	1.04	2,391
			Total	2,391

Polygon 111. **(Figure 2)** *Area: 1.5 acres* Small's milkpea: 27 sand flax: 0

Habitat description: The habitat quality is medium. A very small population of Small's milkpea occurs in this polygon. Small's milkpea could potentially grow throughout this polygon and it could potentially be an area where sand flax could grow on the exposed limestone that traverse this polygon. This polygon has *Jacquemontia curtisii, Crossopetalum ilicifolium, Scutellaria havanensis,* Mascarene templegrass, *Stachytarpheta jamaicensis, Phyllanthus pentaphyllus var. floridanus, Acalypha chamaedrifolia, Rhynchospora floridensis, Crossopetalum ilicifolium, Heliotropium polyphyllum.*
Management recommendations: Continue mowing height and frequency. Treat exotic grasses.

Figure 10.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
18	0.039	0.016	0.17	27
			Total	27

Polygon 112. (Figure 2) *Area: 2.4 acres* Small's milkpea: 2,902 sand flax: 123

Habitat description: Variable quality habitat. The peripheral edges have St. Augustine sod but improves towards the center of the polygon with medium quality habitat. Dominated by Mascarene templegrass with some native grasses *Paspalum caespitosum* and *Schizachyrium* spp. Other species in the polygon *Psidium longipes, Angadenia berteroi, Scutellaria havanensis, Crossopetalum ilicifolium,* sand flax, *Spermacoce terminalis, Pteris bahamensis, Smilax havanensis, Jacquemontia curtisii, Galactia volubilis, Phyla stoechadifolia.*
Management recommendations: Continue mowing height and frequency. Eliminate spreading of St. Augustine sod and Treat exotic grasses.. Weed whacking the canal edge down to the ground is not advisable and could potentially reduce the sand flax population.

Figure 10.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
19	1.793	0.725	0.40	2,902
			Total	2,902

Figure 27.

sand flax				
5	0.146	0.059	0.07	43
6	0.493	0.199	0.04	80
			Total	123

Polygon 126. **(Figure 2)** *Area: 7.9 acres* Small's milkpea: 618 sand flax: 0

Habitat description: Poor quality habitat along the periphery where St. Augustine is dominant around structures and center of this polygon is dominated by Mascarene templegrass. Other species found include *Stachytarpheta jamaicensis and Setaria parviflora.*
Management recommendations: Continue mowing height and frequency. Eliminate spreading of St. Augustine sod and Mascarene templegrass.

Figure 12.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
20	0.143	0.058	0.13	77
21	0.558	0.226	0.24	542
			Total	618

Polygon 191. **(Figure 3)** *Area: 1.9 acres* Small's milkpea: 68 sand flax: Trace

Habitat description: Poor quality habitat along the periphery and around structures where St. Augustine is dominant, to medium quality habitat towards the center and west of the polygon. Small's milkpea is found growing in Mascarene templegrass with some native grasses *Paspalum spp.* and *Schizachyrium* spp.
Management recommendations: Continue mowing height and frequency. Eliminate spreading of St. Augustine sod and treat Mascarene templegrass.

Figure 25.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
25	0.063	0.026	0.27	68
			Total	68

Polygon 194. **(Figure 4)** *Area: 5.3 acres* Small's milkpea: 2,711 sand flax: 0

Habitat description: Medium quality habitat. Small's milkpea growing in Mascarene templegrass some native grasses *Paspalum spp.* and *Schizachyrium* spp. This population could expand from its current location throughout the polygon. Other species found *Chaptalia albicans*.
Management recommendations: Continue mowing height and frequency. Treat exotic Mascarene templegrass.

Figure 25.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
27	0.799	0.323	0.64	2,700
28	0.028	0.011	0.06	7
29	0.019	0.008	0.05	4
			Total	2,711

Polygon 200. **(Figure 2)** *Area: 2.9 acres* Small's milkpea: 1,848 sand flax: 190

Habitat description: Medium quality habitat. The interior of the polygon contains populations of Small's milkpea and sparse populations of sand flax. The edges of the canal hold populations of sand flax. The polygon is dominated by native grasses (*Schizachyrium sanguineum, Paspalum caespitosum)* and Mascarene templegrass. Other species found are; *Psidium longipes, Angadenia berteroi, Scutellaria havanensis, Crossopetalum ilicifolium, Spermacoce terminalis, Pteris bahamensis, Vernonia blodgettii, Galactia volubilis, Selaginella armata var. eatonii, Odontosoria clavata, Anemia adiantifolia, Pteris bahamensis, Smilax havanensis, Bletia purpurea.*
Management recommendations: Continue mowing height and frequency. Weed whacking the canal edge down to the ground or too frequently is not advisable and could potentially reduce the sand flax population. Treat Mascarene templegrass

Figure 10.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
8	1.825	0.739	0.25	1,848
			Total	1,848

Figure 27.

sand flax **populations**				
31	0.189	0.076	0.15	111
32	0.071	0.029	0.16	46
33	0.989	0.4	0.01	33
			Total	190

Polygon 201. **(Figure 2)** *Area: 11.3 acres* Small's milkpea: 9,694 sand flax: 3,379

Habitat description: Medium quality habitat. The north and western edges of the polygon contains populations of Small's milkpea and populations of sand flax. The edges of the canals are high quality habitat for sand flax due to the scarcity of exotic grasses and patchiness of exposed rock. The polygon has native grasses (*Schizachyrium* spp. and *Paspalum* spp,*)* and Mascarene templegrass. Other species found are; *Casuarina equisetifolia, Angadenia berteroi, Psidium longipes, Chaptalia albicans, Pteris bahamensis, Smilax havanensis, Stylosanthes calcicola, Crossopetalum ilicifolium,*

Vernonia blodgettii, Byrsonima lucida, Jacquemontia curtisii, Spermacoce terminalis, Wedelia trilobata, Odontosoria clavata, Selaginella armata var. depressa, Scutallaria havanensis.
Management recommendations: Continue mowing height and frequency. Managing the timing of mowing and weed whacking when sand flax is not flowering and setting seed would help this population. Weed whacking the canal edge down to the ground or too frequently is not advisable and could potentially reduce the sand flax population. Remove the exotic *Casuarina equisetifolia.* Currently the HARB ground maintenance subcontractor stores equipment at the north west corner this is very close to good quality sand flax habitat and should perhaps be moved to a different area to avoid any accidental damage to this population. Spot treat Mascarene templegrass.

Figure 13.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
8	1.825	0.739	1.01	7,460
9	0.021	0.008	0.03	3
11	1.325	0.536	0.39	2,090
12	0.248	0.100	0.39	140
			Total	9,694

Figure 27.

sand flax **populations**				
34	0.918	0.371	0.82	3,046
1	2.055	0.832	0.04	333
			Total	3,379

Polygon 202. (Figure 2) *Area: 0.75 acres* Small's milkpea: 11 sand flax: 944

Habitat description: Medium quality habitat. A small patch of Small's milkpea grows it the south east corner of the polygon. Sand flax is growing throughout this polygon with high densities near the canal edge. Other species*; Angadenia berteroi, Psidium longipes, Pteris bahamensis, Chaptalia albicans, Smilax havanensis, Byrsonima lucida, Tetrazygia bicolor, Senna mexicana var. chapmanii, Crotolaria linearis,* Mascarene templegrass.
Management recommendations: Continue mowing height and frequency. Weed whacking the canal edge down to the ground or too frequently is not advisable and could potentially reduce the sand flax population. Treat Mascarene templegrass.

Figure 13.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
10	0.013	0.005	0.22	11
			Total	11

Figure 27.

sand flax **populations**				
2	0.729	0.295	0.32	944
			Total	944

Polygon 203. (Figures 2 and 5) *Area: 7.6 acres* Small's milkpea: 58 sand flax: 85

Habitat description: Medium quality habitat. Polygon 203 has areas of Mascarene templegrass with native grasses (*Schizachyrium* spp. and *Paspalum* spp,*).* Other species include; *Phyla stoechadifolia, Trema lamarkiana, Angadenia berteroi*, and the exotic *Casuarina equisetifolia*.
Management recommendations: Continue mowing height and frequency. Weed whacking the canal edge down to the ground or too frequently is not advisable. Remove the exotic *Casuarina equisetifolia* and spot treat Mascarene templegrass.

Figure 14.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
13	0.229	0.093	0.06	58
			Total	58

Figure 28.

sand flax **populations**				
3	0.101	0.041	0.20	82
4	0.010	0.004	0.07	3
			Total	85

Polygon 204. (Figures 4 and 5) *Area: 3.1 acres* Small's milkpea: 80 sand flax: 194

Habitat description: Medium quality habitat. There is a small population of Small's milkpea. This polygon is intermingled with *Paspalum caespitosum, Paspalum setaceum, Schizachyrium sanguineum* and the exotic Mascarene templegrass. *Chaptalia albicans* are also found in the polygon.
Management recommendations: Continue mowing height and frequency. Spot treat Mascarene templegrass.

Figure 16.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
46	0.004	0.002	0.35	6
48	0.073	0.029	0.25	74
			Total	80

Figure 29

sand flax **populations**				
7	0.224	0.090	0.10	90
8	0.073	0.030	0.20	59
10	0.051	0.021	0.15	31
11	0.013	0.005	0.09	5
12	0.156	0.063	0.01	6
13	0.008	0.003	0.06	2
			Total	194

Polygon 205. **(Figure 5)** *Area: 4.5 acres* Small's milkpea: 110 sand flax: 898

Habitat description: Medium quality habitat. Strong populations of sand flax cover most of this polygon. Several small population of Small's milkpea grow throughout the area. This polygon is intermingled with *Paspalum caespitosum, Paspalum setaceum, Schizachyrium sanguineum* and the exotic Mascarene templegrass. *Chaptalia albicans, Stylosanthes calcicola* are also found in the polygon.
Management recommendations: Continue mowing height and frequency. Spot treat Mascarene templegrass.

Figure 16.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
49	0.072	0.029	0.35	102
50	0.009	0.004	0.13	5
160	0.003	0.001	0.26	3
			Total	110

Figure 29.

sand flax **populations**				
15	1.090	0.444	0.10	444
37	0.550	0.255	0.20	445
16	0.036	0.015	0.06	9
			Total	898

Polygon 206. **(Figure 4)** *Area: 31.7 acres* Small's milkpea: 44,284 sand flax: 13,074

Habitat description: Medium quality habitat. Both species are found throughout the polygon. Polygon 206 is dominated by *Paspalum caespitosum, Paspalum setaceum, Schizachyrium sanguineum* with sparse areas of exotic Mascarene templegrass. Small areas with St. Augustine sod. Other species found here are; *Ipomoea microdactyla, Spermacoce terminalis, Scutellaria havanensis, Jacquemontia curtisii, Chaptalia albicans, Psidium longipes, Crossopetalum ilicifolium, Stylosanthes calcicola,* and *Angadenia berteroi.*

Management recommendations: Continue mowing height and frequency. Managing the height of weed whacking will help sand flax population. Spot treat Mascarene templegrass.

Figure 16.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
158	29.300	11.857	0.37	44,267
47	0.033	0.013	0.13	17
			Total	44,284

Figure 29.

sand flax **populations**				
14	0.039	0.016	0.02	3
29	26.917	10.893	0.12	13,071
			Total	13,074

Polygon 207. **(Figure 4)** *Area: 1.7 acres* Small's milkpea: 8 sand flax: 0

Habitat description: Poor quality habitat. Populations are close to the road in areas with the exotic Mascarene templegrass. Though small, these populations should persist and grow. Other plants found are; *Angadenia berteroi,* and *Spermacoce terminalis*.
Management recommendations: Continue mowing height and frequency. Treat Mascarene templegrass.

Figure 20.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
41	0.010	0.004	0.05	2
42	0.011	0.004	0.14	6
			Total	8

Polygon 208. **(Figure 4)** *Area: 1.4 acres* Small's milkpea: 79 sand flax: 0

Habitat description: Poor quality habitat. Several low density populations throughout the polygon associated with the exotic Mascarene templegrass. Though small, these populations should persist and grow.
Management recommendations: Continue mowing height and frequency. Treat Mascarene templegrass.

Figure 20.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Density**
38	0.124	0.050	0.14	70
39	0.009	0.004	0.14	5
40	0.009	0.004	0.06	2
43	0.003	0.001	0.15	2
			Total	79

Polygon 209. **(Figure 4)** *Area: 1.1 acres* Small's milkpea: 86 sand flax: 0

Habitat description: Poor quality habitat. Two low density populations associated with the exotic Mascarene templegrass. These small populations should persist and grow. *Spermacoce terminalis* is also found in this polygon.
Management recommendations: Continue mowing height and frequency. Treat Mascarene templegrass.

Figure 20.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
44	0.003	0.001	0.75	8
45	0.055	0.022	0.35	78
			Total	86

Polygon 210. **(Figure 4)** *Area: 1.5 acres* Small's milkpea: 39 sand flax: 0

Habitat description: Poor quality habitat. Three small populations found close to the canal associated with the exotic Mascarene templegrass. Other plants found are; *Pteris bahamensis*, and *Selaginella armata* var. *eatonii*.
Management recommendations: Continue mowing height and frequency. St. Augustine sod is found at several locations in the polygon 210 and could pose a threat to Small's milkpea population 35. Treat St. Augustine and Mascarene templegrass.

Figure 15.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
35	0.020	0.008	0.27	22
36	0.012	0.005	0.25	12
37	0.005	0.002	0.26	5
			Total	39

Polygon 211. **(Figure 4)** *Area: 1.4 acres* Small's milkpea: 919 sand flax: 0

Habitat description: Poor quality habitat. Polygon 211 is mostly Mascarene templegrass with some native grasses (*Schizachyrium* spp. and *Paspalum* spp,*)* and sparse St. Augustine sod.
Management recommendations: Continue mowing height and frequency. Treat Mascarene templegrass.

Figure 15.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
26	0.379	0.153	0.60	919
			Total	919

Polygon 212. **(Figure 5)** *Area: 0.2 acres* Small's milkpea: 0 sand flax: 12

Habitat description: Medium quality habitat. This is a small population of sand flax but it should persist and grow as it is surrounded by other populations in adjacent polygons. This polygon is intermingled with *Paspalum caespitosum, Paspalum setaceum,*

Schizachyrium sanguineum and the exotic Mascarene templegrass. Other plants found; *Psidium longipes, Angadenia berteroi, Scutellaria havanensis, Crossopetalum ilicifolium, Spermacoce terminalis, Phyla stoechadifolia, Crossopetalum ilicifolium, Scutelaria havanensis,* and *Jacquemontia curtisii*.
Management recommendations: Continue mowing height and frequency. Treat Mascarene templegrass.

Figure 29.

sand flax **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
9	0.043	0.017	0.07	12
			Total	12

Polygon 213. **(Figure 5)** *Area: 113.4 acres* Small's milkpea: 172,552 sand flax: 583

Habitat description: Varied habitat quality, mostly poor habitat, though in the south of the polygon the habitat is classified as medium. The polygon is mostly dominated with the exotic Mascarene templegrass but the periphery also has natives *Paspalum caespitosum, Paspalum setaceum, Schizachyrium sanguineum*. Several small scattered populations of sand flax occur to the north and one larger population to the north east of the polygon. All populations have low densities of sand flax. The whole of Polygon 213 is potential habitat for Small's milkpea except in areas with St. Augustine sod often associated with the structures in this polygon. Densities of Small's milkpea do vary throughout the polygon but there are large populations. Other plants found; *Pteris bahamensis, Spermacoce terminalis, Crossopetalum ilicifolium, Cynanchum blodgettii, Byrsonima lucida, Chaptalia albicans, Psidium longipes, Angadenia berteroi, Smilax havanensis, Jacquemontia curtisii, Bletia purpurea, Stylosanthes calcicola, Ipomoea microdactyla, Tetrazygia bicolor, Selaginella armata var. eatonii, Pteris vittata, Senna mexicana var. chapmanii, Ernodea littoralis, Vernonia blodgettii,* and *Bletia purpurea.*
Management recommendations: Continue mowing height and frequency. Eliminate spreading of St. Augustine sod. Managing the height of weed whacking for sand flax. Due to the high amount of pine rockland species this is a good area to preserve however there are also large areas of the exotic Mascarene templegrass and St. Augutine sod, and given the use of the land (ammunition storage) it could be difficult to restore. Treat St. Augustine and Mascarene templegrass.

Figure 16.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
55	8.190	3.315	0.39	12,761
56	0.021	0.008	0.52	43
57	1.296	0.525	0.20	1,049
58	2.037	0.824	0.38	3,133
59	5.873	2.377	0.90	21,390
60	3.364	1.361	0.22	2,995
61	0.061	0.024	0.24	59
62	0.036	0.015	0.34	50
63	2.853	1.155	0.20	2,309
64	0.016	0.006	1.51	97
65	7.598	3.075	0.85	26,137
68	0.048	0.020	0.37	72
74	0.015	0.006	0.18	11
76	7.913	3.202	0.70	22,416
77	4.822	1.951	0.59	11,513
78	0.644	0.260	0.31	808
79	0.018	0.007	1.45	104
80	3.327	1.346	0.91	12,251
81	0.120	0.049	1.12	543
86	6.225	2.519	1.54	38,797
87	0.051	0.021	0.63	130
88	4.217	1.707	0.81	13,824
89	1.467	0.594	0.30	1,781
90	0.275	0.111	0.25	278
			Total	172,552

Figure 29.

sand flax **populations**				
17	0.209	0.085	0.05	45
18	0.542	0.219	0.03	65
19	0.384	0.156	0.02	29
23	2.741	1.109	0.04	444
			Total	583

Polygon 214. **(Figure 5 and 6)** *Area: 16.9 acres* Small's milkpea: 875 sand flax: 2

Habitat description: Poor quality habitat. Only the northern part of Polygon 214 is suitable for Small's milkpea and sand flax. A very small population of sand flax exists in

the northern part of the polygon while Small's milkpea is found sparsely but scattered throughout this area. Ground cover is a mixture of *Muhlenbergia capillaris, Eragrostis elliottii, Andropogon longiberbis, Aristida purpurascens,* and Mascarene templegrass. Other species found; *Chaptalia albicans, Vernonia blodgettii, Cyanchum blodgettii, Senna mexicana var. chapmanii, Angadenia berteroi, Phyla nodiflora,* and *Pteris bahamensis*.
Management recommendations: Continue mowing height and frequency. Prevent the spread of shrubs and canopy trees from spreading further into the north of this polygon. Spot treat Mascarene templegrass.

Figure 17. Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
92	0.901	0.365	0.24	875
			Total	875

Figure 32. sand flax **populations**				
35	0.006	0.003	0.08	2
			Total	2

Polygon 216. **(Figure 5 and 6)** *Area: 7.2 acres* Small's milkpea: 813 sand flax: Trace

Habitat description: Medium quality habitat. This polygon has a mixture of *Muhlenbergia capillaris, Eragrostis elliottii, Andropogon longiberbis, Aristida purpurascens,* and the exotic Mascarene templegrass. Other species found; *Pteris bahamensis, Chaptalia albicans,* and *Vernonia blodgettii*.
Management recommendations: Continue mowing height and frequency. Treat Mascarene templegrass.

Figure 17. Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
91	1.004	0.406	0.20	813
			Total	813

Polygon 226. **(Figure 5)** *Area: 9.9 acres* Small's milkpea: 40,112 sand flax: 0

Habitat description: Poor quality habitat. Small's milkpea associated with the exotic Mascarene templegrass and occurs in high densities. Other species also found are *Chaptalia albicans*.
Management recommendations: Continue mowing height and frequency. St. Augustine grows around the storage areas and should be kept from expanding into the Small's milkpea population. Treat St. Augustine and Mascarene templegrass.

Figure 16.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
66	7.288	2.949	1.36	40,112
			Total	40,112

Polygon 227. **(Figure 5)** *Area: 14 acres* Small's milkpea: 17,334 sand flax: 0

Habitat description: Poor quality habitat. Small's milkpea associated with the exotic Mascarene templegrass. The majority of the polygon has potential for Small's milkpea to occur. Other species also found are; *Chaptalia albicans, Angadenia berteroi, Psidium longipes, Spermacoce terminalis*, and *Pteris bahamensis*.
Management recommendations: Continue mowing height and frequency. St. Augustine grows around the storage areas and should be kept from expanding into the Small's milkpea population. Treat St. Augustine and Mascarene templegrass.

Figure 16.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
67	7.260	2.938	0.59	17,334
			Total	17,334

Polygon 228. **(Figure 4)** *Area: 5.8 acres* Small's milkpea: 8,056 sand flax: 1,406

Habitat description: Medium quality habitat. This polygon has a mixture of native grasses *Schizachyrium sanguineum, Muhlenbergia capillaris, Aristida purpurascens, Andropogon longiberbis, Paspalum caespitosum* and the exotic Mascarene templegrass and *Eremochloa ophiuroides*. Other species found in this polygon are *Ipomoea microdactyla, Crossopetalum ilicifolium, Stylosanthes calcicola, Chaptalia albicans, Jacquemontia curtisii*, and *Scutellaria havanensis*.
Management recommendations: Continue mowing height and frequency. Treat St. Augustine and Mascarene templegrass.

Figure 16.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
51	3.828	1.549	0.52	8,056
			Total	8,056

Figure 29.

sand flax **populations**				
20	4.342	1.757	0.08	1,406
			Total	1,406

Polygon 229. **(Figure 4)** *Area: 3.3 acres* Small's milkpea: 2,363 sand flax: 0

Habitat description: Varied habitat with medium habitat in the south and poor habitat in the North of the polygon. There is a mixture native grasses *Schizachyrium sanguineum, Aristida purpurascens, Andropogon longiberbis, Paspalum caespitosum* and the exotic Mascarene templegrass and *Eremochloa ophiuroides* in the southern part of the polygon. In the northern part of the polygon Mascarene templegrass becomes more dominant.
Management recommendations: Continue mowing height and frequency. Treat Mascarene templegrass.

Figure 20.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
52	2.246	0.909	0.26	2,363
			Total	2,363

Polygon 230. **(Figure 4)** *Area: 1.7 acres* Small's milkpea: 2,392 sand flax: 0

Habitat description: Poor quality habitat for both Small's milkpea and sand flax. Polygon 230 is dominated by Mascarene templegrass.
Management recommendations: Continue mowing height and frequency. Control and treat any spreading of exotic St. Augustine sod and *Wedelia trilobata* which is an excluder and will out compete Small's milkpea when it grows thick and in dense mats.

Figure 25.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
33	0.683	0.276	0.86	2,377
34	0.066	0.027	0.06	15
			Total	2,392

Polygon 252. **(Figure 7)** *Area: 9.8 acres* Small's milkpea: 3,847 sand flax: 499

Habitat description: Medium quality habitat. Sand flax populations are sparse in the south of the polygon on an area slightly raised and with more native grasses. The Polygon is mixed native grasses *Andropogon longiberbis* , *Eustachys petraea* and *Paspalum caespitosum* with a drainage ditch running through the middle in an east-west direction with sparse Mascarene templegrass. Other species include *Chaptalia albicans*.
Management recommendations: Continue mowing height and frequency. Spot treat *Zyosia tenuifolia*.

Figure 20.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
53	4.188	1.695	0.16	2,712
54	2.806	1.135	0.10	1,135
			Total	3,847

Figure 31.

sand flax **populations**				
21	0.184	0.075	0.07	50
22	1.850	0.749	0.06	449
			Total	499

Polygon 253. **(Figure 6)** *Area: 4.0 acres* Small's milkpea: 5,523 sand flax: 0

Habitat description: Poor quality habitat. Most of Polygon 253 is covered by Mascarene templegrass. Other species found are *Chaptalia albicans*.
Management recommendations: Continue mowing height and frequency. Control spread and treat St. Augustine sod and Mascarene templegrass from around bunkers and structures.

Figure 16.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
69	0.291	0.118	3.12	3,676
70	1.047	0.424	0.25	1,059
73	0.260	0.105	0.75	789
			Total	5,523

Polygon 254. **(Figure 6)** *Area: 1.0 acres* Small's milkpea: 5,693 sand flax: 0

Habitat description: Poor quality habitat. Polygon 254 is covered by Mascarene templegrass. Other species found are *Chaptalia albicans*.
Management recommendations: Continue mowing height and frequency. Treat Mascarene templegrass.

Figure 16.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
71	1.005	0.407	1.40	5,693
			Total	5,693

Polygon 255. **(Figure 6)** *Area: 5.1 acres* Small's milkpea: 37,649 sand flax: 0

Habitat description: Poor quality habitat. Polygon 255 is dominated by the exotic Mascarene templegrass. Other species found are *Chaptalia albicans*.
Management recommendations: Continue mowing height and frequency. There are several large areas of St. Augustine sod in the north and east of the polygon. Control spread and treat St. Augustine sod and Mascarene templegrass from these areas.

Figure 16.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
72	3.813	1.543	2.44	37,649
			Total	37,649

Polygon 256. **(Figure 6)** *Area: 3.5 acres* Small's milkpea: 9,378 sand flax: 0

Habitat description: Poor quality habitat. The polygon is covered by the exotic Mascarene templegrass. Other species found are *Spermacoce terminalis*.
Management recommendations: Continue mowing height and frequency. Control spread of St. Augustine sod which occurs around the building and parking lot in the north-east and east of the polygon. Treat St. Augustine and Mascarene templegrass.

Figure 16.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
75	2.107	0.853	1.10	9,378
			Total	9,378

Polygon 260. (**Figure 6)** *Area: 47.2 acres* Small's milkpea: 11,727 sand flax: 4,306

Habitat description: Varied habitat with poor habitat near the runway and medium quality habitat in the south-east. This polygon has native grasses *Schizachyrium sanguineum, Schizachyrium gracile, Andropogon longiberbis, Paspalum caespitosum* and the exotic Mascarene templegrass. Other rare and threatened species found; *Bletia purpurea, Selaginella armata var. eatonii, Byrsonima lucida, Jacquemontia curtisii, Crossopetalum ilicifolium, Psidium longipes, Stylosanthes calcicola, Smilax havanensis, Spermacoce terminalis, Cynanchum blodgettii, Tetrazygia bicolor, Chaptalia albicans, Pteris bahamensis, Angadenia berteroi, Vernonia blodgettii, Senna mexicana var. chapmanii,* and *Melanthera parvifolia.*
Management recommendations: Continue mowing height and frequency. Treat Mascarene templegrass.

Figure 18 and 19.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
93	0.054	0.022	0.01	3
94	0.138	0.056	0.01	5
95	0.311	0.126	0.02	20
96	0.114	0.046	0.03	15
97	0.570	0.230	0.16	369
98	0.063	0.025	0.01	3
99	0.878	0.355	0.46	1,635
100	2.094	0.847	1.14	9,658
101	0.208	0.084	0.02	19
			Total	11,727

Figure 30.

sand flax **populations**				
27	2.128	0.861	0.50	4,306
			Total	4,306

Polygon 261. **(Figure 6)** *Area: 16.9 acres* Small's milkpea: 36 sand flax: 0

Habitat description: Varied habitat with poor quality habitat in the east and south, and medium quality habitat in the west of the Polygon. The major part of the polygon (East and south) has dense stands of exotic grasses *Pennisetum purpureum and Paspalum notatum* (bahia grass). Small's milkpea is found in several small populations scattered throughout the Polygon. Other rare and threatened species found (mainly in the eastern part of the polygon); *Selaginella armata var. eatonii, Pteris bahamensis, Byrsonima lucida, Senna mexicana var. chapmanii, Crossopetalum ilicifolium.*

Management recommendations: mowing is currently too high. This area has large areas of exotics grasses that should be controlled.

Figure 18.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
82	0.031	0.013	0.02	3
83	0.317	0.128	0.02	24
84	0.021	0.009	0.02	2
85	0.044	0.018	0.04	7
			Total	36

Polygon 262. **(Figure 6)** *Area: 20.9 acres* Small's milkpea: 3,530 sand flax: 1,717

Habitat description: Variable quality habitat with the majority of the polygon poor habitat however medium quality habitat in the eastern part of the Polygon. The polygon ground cover is mainly the exotic grasses Mascarene templegrass, *Pennisetum purpureum, Paspalum notatum.* The eastern part of the polygon has more native species like *Schizachyrium rhizomatum, Paspalum caespitosum, Rhynchospora colorata, Morinda royoc, Flaveria linearis,* and *Eragrostis elliottii*. Other rare and threatened species found; *Selaginella armata var. eatonii, Pteris bahamensis, Bletia purpurea,* sand flax, *Senna mexicana var. chapmanii, Angadenia berterori, Bletia purpurea, Crossopetalum ilicifolium, Psidium longipes, Spermacoce terminalis, Stylosanthes calcicola, Jacquemontia curtisii, Byrsonima lucida, Cynanchum blodgettii, Smilax havanensis,* and *Chaptalia albicans.*

Management recommendations: The eastern part of the polygon where both Small's milkpea and sand flax populations exist should be continued to be mowed at the same frequency and a reduced mowing height. Managing the timing of mowing and weed whacking especially along canals to times when sand flax is not flowering. The exotics in this polygon should be managed to prevent infestation of the medium quality eastern area.

Figure 18.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
161	1.407	0.569	0.62	3,530
			Total	3,530

Figure 30.

sand flax **populations**				
24	0.073	0.029	0.35	103
25	0.008	0.003	2.00	66
36	1.224	0.495	0.30	1,486
26	0.026	0.010	0.60	62
			Total	1,717

Polygon 277. **(Figure 9)** *Area: 1.2 acres* Small's milkpea: 70 sand flax: 0

Habitat description: Poor quality habitat. This polygon is dominated by exotic St. Augustine sod and *Eremochloa ophiuroides*. This population could be out competed by St. Augustine grass.
Management recommendations: Continue mowing height and frequency and remove exotic grasses.

Figure 25.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
32	0.070	0.028	0.25	70
			Total	70

Polygon 280. **(Figure 7)** *Area: 12.5 acres* Small's milkpea: 893 sand flax: 0

Habitat description: Poor quality habitat. The peripheral areas of the Polygon have small scattered populations of Small's milkpea. The ground cover is St. Augustine, Mascarene templegrass, *Sisyrinchium angustifolium, Rhynchospora colorata*, *Fimbristylis cymosa* and *Bidens alba* var. *radiata*. Other rare and threatened species found; *Chaptalia albicans, Scutellaria havanensis, Angadenia berteroi.*
Management recommendations: Continue mowing height and frequency. Treat St. Augustine and Mascarene templegrass.

Figure 21.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
130	0.011	0.004	0.05	2
131	0.009	0.004	0.03	1
132	0.007	0.003	0.10	3
133	0.006	0.002	0.04	1
134	0.098	0.040	0.12	49
135	0.053	0.021	0.06	12
136	0.009	0.004	0.08	3
137	0.010	0.004	0.05	2
138	0.015	0.006	0.18	11
139	1.297	0.525	0.14	735
142	0.009	0.004	0.08	3
143	0.072	0.029	0.24	69
144	0.004	0.001	0.14	2
			Total	893

Polygon 281. **(Figure 7)** *Area: 16.9 acres* Small's milkpea: 9,195 sand flax: 0

Habitat description: Poor quality habitat. The Small's milkpea population is found around the east, south and west of the polygon perimeter. The ground cover is Mascarene templegrass, *Stachytarpheta jamaicensis, Setaria parviflora, Rhynchospora colorata*, and *Fimbristylis cymosa*.
Management recommendations: This is a highly impacted area. Continue mowing height and frequency. Treat Mascarene templegrass.

Figure 21 and 22.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
145	6.054	2.450	0.34	8'329
146	0.475	0.192	0.45	865
			Total	9,195

Polygon 282. **(Figure 7 and 8)** *Area: 52.9 acres* Small's milkpea: 530 sand flax: 0

Habitat description: Poor quality habitat. The peripheral areas of the Polygon have small scattered populations of Small's milkpea. The ground cover consists of St. Augustine and Mascarene templegrass *Paspalum notatum* with some natives *Eustachys petraea, Eragrostis elliottii, Rhynchospora floridensis, Phyla nodiflora, Stachytarpheta jamaicensis,* and *Dyschoriste angusta*.

Management recommendations: This is a highly impacted area. Continue mowing height and frequency. Treat St. Augustine and Mascarene templegrass.

Figure 22 and 23.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
147	0.019	0.008	0.01	1
148	0.277	0.112	0.20	224
149	0.231	0.093	0.30	280
150	0.032	0.013	0.01	1
151	0.015	0.006	0.02	1
152	0.011	0.005	0.07	3
153	0.018	0.007	0.03	2
154	0.009	0.004	0.03	1
155	0.117	0.047	0.01	5
156	0.033	0.013	0.03	4
157	0.071	0.029	0.02	7
			Total	530

Polygon 289. **(Figure 8)** *Area: 4.4 acres* Small's milkpea: 11 sand flax: 0

Habitat description: Poor quality habitat containing one small population of Small's milkpea. The ground cover is mainly St. Augustine, *Paspalum notatum, Stachytarpheta jamaicensis,* and *Dyschoriste angusta*.
Management recommendations: This area has poor habitat and the population may persist but given the low numbers could be extirpated in the long term. Continue mowing height and frequency. Treat St. Augustine.

Figure 24.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
121	0.133	0.054	0.02	11
			Total	11

Polygon 291. **(Figure 7)** *Area: 13.1 acres* Small's milkpea: 29 sand flax: Trace

Habitat description: Poor quality habitat. The peripheral areas of the Polygon have small scattered populations of Small's milkpea. The ground cover consists of Mascarene templegrass, *Setaria parviflora, Sida acuta, Phyla nodiflora,* and *Indigofera miniata* var. *florida.*
Management recommendations: This is area has poor habitat and the population may persist but given the low numbers could be extirpated in the long term. Continue mowing height and frequency. Treat Mascarene templegrass.

Figure 21.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
105	0.010	0.004	0.08	3
106	0.010	0.004	0.05	2
107	0.013	0.005	0.06	3
108	0.050	0.020	0.04	8
109	0.004	0.002	0.12	2
110	0.002	0.001	0.10	1
111	0.007	0.003	0.17	5
112	0.001	0.001	0.37	2
114	0.001	0.001	0.17	1
113	0.001	0.001	0.33	2
			Total	29

Polygon 294. **(Figure 6 and 7)** *Area: 13.3 acres* Small's milkpea: 2,091 sand flax: 6

Habitat description: Poor quality habitat. The western portion of the polygon is dominated by St. Augustine, *Paspalum notatum,* and Mascarene templegrass. Small's milkpea *and* sand flax are found in the east of the Polygon with native grasses *Schizachyrium sanguineum, Schizachyrium gracile, Andropogon longiberbis, Paspalum caespitosum* and the exotic Mascarene templegrass. Though still poor habitat, the eastern part of the polygon has more native species and is generally better than the rest of the polygon. Other rare and threatened species found; *Crossopetalum ilicifolium, Jacquemontia curtisii, Pteris bahamensis,* and *Selaginella armata* var. *eatonii.*
Management recommendations: Continue mowing frequency and reduce mowing height to prevent organic matter build up and prevent spread of exotic grasses. Treat exotic grasses.

Figure 19.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
102	0.328	0.133	0.02	29
103	0.059	0.024	0.02	4
104	2.119	0.857	0.24	2,058
			Total	2,091

Figure 30.

sand flax **populations**				
28	0.116	0.047	0.01	6
			Total	6

Polygon 296. **(Figure 7)** *Area: 10.1 acres* Small's milkpea: 37 sand flax: 0

Habitat description: Poor quality habitat. The peripheral areas of the Polygon have small scattered populations of Small's milkpea. The ground cover consists of St. Augustine, *Paspalum* s *notatum*, Mascarene templegrass, *Fimbristylis cymosa, Eustachys petraea, Bidens alba* var. *radiata, Pennisetum purpureum*, and *Centrosema virginianum*. Other rare and threatened species found; *Chaptalia albicans, Ipomoea indica* var. *acuminate*.
Management recommendations: Continue mowing frequency and reduce mowing height to prevent organic matter build up. Treat exotic grasses.

Figure 21 and 22.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
115	0.039	0.016	0.05	8
116	0.124	0.050	0.05	23
117	0.008	0.003	0.15	5
118	0.003	0.001	0.08	1
			Total	37

Polygon 304. **(Figure 8)** *Area: 1.4 acres* Small's milkpea: 327 sand flax: 0

Habitat description: Poor quality habitat. The peripheral areas of the Polygon have two small populations of Small's milkpea. The ground cover is dominated by St. Augustine, *Paspalum notatum*, Mascarene templegrass and includes *Bidens alba* var. *radiata, Vigna luteola, Stachytarpheta jamaicensis, Eustachys petraea, Schinus terebinthifolius,* and *Pennisetum purpureum.*
Management recommendations: This area has poor habitat and the population may persist. Continue mowing frequency and reduce mowing height to prevent organic matter buildup. Treat exotic grasses.

Figure 22 and 24.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
119	0.010	0.004	0.05	2
120	0.670	0.271	0.12	325
			Total	327

Polygon 307. **(Figure 7)** *Area: 0.6 acres* Small's milkpea: 4 sand flax: 0

Habitat description: Poor quality habitat. The peripheral areas of the Polygon have two small populations of Small's milkpea. The ground cover is St. Augustine, Mascarene templegrass, *Sisyrinchium angustifolium* and *Bidens alba* var. *radiata*.

Management recommendations: Continue mowing height and frequency. Treat St. Augustine, Mascarene templegrass.

Figure 20.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
140	0.009	0.004	0.03	1
141	0.003	0.001	0.3	3
			Total	4

Polygon 325. **(Figure 9)** *Area: 0.4 acres* Small's milkpea: 13 sand flax: 0

Habitat description: Poor quality habitat. The ground cover is dominated by Mascarene templegrass. This is a small population but should persist.
Management recommendations: Continue mowing height and frequency. Treat Mascarene templegrass.

Figure 26.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
122	0.006	0.003	0.50	13
			Total	13

Polygon 327. (Figure 9) *Area: 0.7 acres* Small's milkpea: 14 sand flax: 0

Habitat description: Poor quality habitat. Polygon 327 is dominated by Mascarene templegrass. These are small populations with other small populations in close proximity and should persist.
Management recommendations: Continue mowing height and frequency. Treat Mascarene templegrass.

Figure 26.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
123	0.003	0.001	1.05	13
162	0.001	0.001	0.10	1
			Total	14

Polygon 329. (Figure 9) *Area: 0.7 acres* Small's milkpea: 47 sand flax: 0

Habitat description: Poor quality habitat. Polygon 329 is dominated by Mascarene templegrass but also contains some native grasses (*Schizachyrium* spp., *Andropogon* spp.). Several small populations should persist in this location.

Management recommendations: Continue mowing height and frequency. Treat Mascarene templegrass.

Figure 26.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
124	0.005	0.002	0.5	12
125	0.006	0.002	0.6	15
126	0.003	0.001	0.9	13
127	0.003	0.001	0.6	7
			Total	47

Polygon 330. (Figure 9) *Area: 0.9 acres* Small's milkpea: 27 sand flax: 0

Habitat description: Poor quality habitat. Ground cover is mainly Mascarene templegrass but also contains some native grasses (*Schizachyrium* spp., *Andropogon* spp.).
Management recommendations: Continue mowing height and frequency. Treat Mascarene templegrass.

Figure 26.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
128	0.041	0.017	0.15	25
129	0.003	0.001	0.2	2
			Total	27

Polygon 344. (Figure 9) *Area: 1.1 acres* Small's milkpea: 61 sand flax: 0

Habitat description: Poor quality habitat. Polygon 344 is dominated by Mascarene templegrass some and St. Augustine sod which occurs around the structures.
Management recommendations: Continue mowing height and frequency. Treat Mascarene templegrass.

Figure 20.

Small's milkpea **populations**	**Acres**	**Hectares**	**Density per m^2**	**Estimated Density**
30	0.041	0.017	0.35	58
31	0.001	0.000	0.67	3
			Total	61

Table 4. Quick reference table listing polygons with population estimates and habitat quality

Polygon	Small's milkpea	Sand flax	Habitat quality
0	3,132	3,985	Medium
6	240	Trace	Medium
7	347	0	Poor
99	2,366	0	Poor
101	2,391	0	Medium
111	27	0	Medium
112	2,902	123	Low-Medium
126	618	0	Poor
191	68	Trace	Poor-Medium
194	2,711	0	Medium
200	1,848	190	Medium
201	9,694	3,379	Medium-High
202	11	944	Medium
203	58	85	Medium
204	80	194	Medium
205	110	898	Medium
206	44,284	13,074	Medium
207	8	0	Poor
208	79	0	Poor
209	86	0	Poor
210	39	0	Poor
211	919	0	Poor
212	0	12	Medium
213	172,552	583	Poor-Medium
214	875	2	Poor
216	813	Trace	Medium
226	40,112	0	Poor
227	17,334	0	Poor
228	8,056	1,406	Medium
229	2,363	0	Poor-Medium
230	2,392	0	Poor
252	3,847	499	Medium
253	5,523	0	Poor
254	5,693	0	Poor
255	37,649	0	Poor
256	9,378	0	Poor
260	11,727	4,306	Poor-Medium
261	36	0	Poor-Medium

Polygon	Small's milkpea	Sand flax	Habitat quality
262	3,530	1,717	Poor-Medium
277	70	0	Poor
280	893	0	Poor
281	9,195	0	Poor
282	530	0	Poor
289	11	0	Poor
291	29	Trace	Poor
294	2,091	6	Poor
296	37	0	Poor
304	327	0	Poor
307	4	0	Poor
325	13	0	Poor
327	14	0	Poor
329	47	0	Poor
330	27	0	Poor
344	61	0	Poor

Management Recommendations

All areas once a part of the original pine rockland ecosystem that were surveyed have been previously disturbed. They were all mechanically scraped with a blade and all understory palms and shrubs, and all trees, were removed given the principle purpose of HARB as an active base. Following clearing, native grasses, some shrub and herbaceous species were able to persist and/or recolonize. In more natural settings, Small's milkpea and sand flax grow in full sun under a sparse canopy and are dependent on fire to keep the understory and canopy open. Several pine rockland species have managed to persist at HARB despite it being a highly managed system.

The mowing regime at HARB has greatly assisted in maintaining the pine rockland species. Mowing has acted as a surrogate for periodic fires, a necessary disturbance for this community, and due to the height of mowing has allowed certain pine rockland species, including some woody species (e.g. *Crossopetalum ilicifolium*) to persist.

The frequency of mowing and weed whacking should be continued as it has allowed the continued persistence of both Small's milkpea and sand flax. Timing of mowing when sand flax is in flower and setting seeds could impact populations but more research is need to confirm this. Along the canal and ditch banks the vegetation is often weed whacked to ground level and will have adverse effects on the sand flax populations growing there. Preliminary data from a different project (sand flax demography) suggests that cutting the plant too low, 2 centimeters (cm), kills the plant. Raising the cutting height of the weed whacking would benefit sand flax in these areas. We recommend that weed whacking does not go below 5 cm.

Exotic grasses are the major threat to Small's milkpea and sand flax. In areas densely covered with St. Augustine, and *Pennisetum purpureum*, Small's milkpea and sand flax did not occur. However, there was an affinity of Small's milkpea to occur with the exotic sod Mascarene templegrass. Even in dense monocultures of Mascarene templegrass, Small's milkpea occurred and thrived. Sand flax did not occur with any exotic grasses.

Pine rocklands are generally low nutrient ecosytems. Mowing too high and the extent of some exotic grasses, like *Pennisetum purpureum*, which grows rapidly, could adversely affect Small's milkpea and sand flax. This is particularly prevalent in the south western part of HARB, in Polygons 261and 262. A controlled fire through this area would eliminate the accumulation of duff and provide better habitat for both Small's milkpea and sand flax in this area. However, we do realize that current management of grass height along the runways is to dissuade avian presence and minimize collisions and therefore may not be feasible.

It is recommended in areas where St. Augustine and *Pennisetum purpureum* occurs in proximity to Small's milkpea and sand flax populations that these exotics be controlled to avoid out-competing the populations. In order to improve the pine rockland habitat of HARB, treatment and management of Mascarene templegrass is advised where Small's milkpea grows. There are higher densities of Small's milkpea growing in some areas of Mascarene templegrass than would naturally occur in pine rocklands. The total population density may drop with treating Mascarene templegrass as Small's milkpea will be forced to compete with native grasses after the Mascarene templegrass is removed; however, given the densities on HARB this will not adversely affect the viability of the total population. We are currently restoring a pine rockland adjacent to HARB at the Special Operations Command South property where we are successfully restoring a pine rockland containing both Small's milkpea and sand flax in areas covered in Mascarene templegrass. We understand Mascarene templegrass is a cultivar species and removing the grass would be costly and time consuming, therefore these are only our recommendations to improve the pine rockland habitat in which endemic rare plants occur.

Acknowledgements

The authors would like to acknowledge Keith Bradley and Sarah Martin for their assistance with surveying for plants at Homestead Air Reserve Base. Their assistance was invaluable. Thanks to George Gann, who reviewed the document and gave management recommendations. We would also like to thank Steve Woodmansee from management recommendations. Photographs of Small's milkpea and sand flax were taken by James Johnson.

Figures

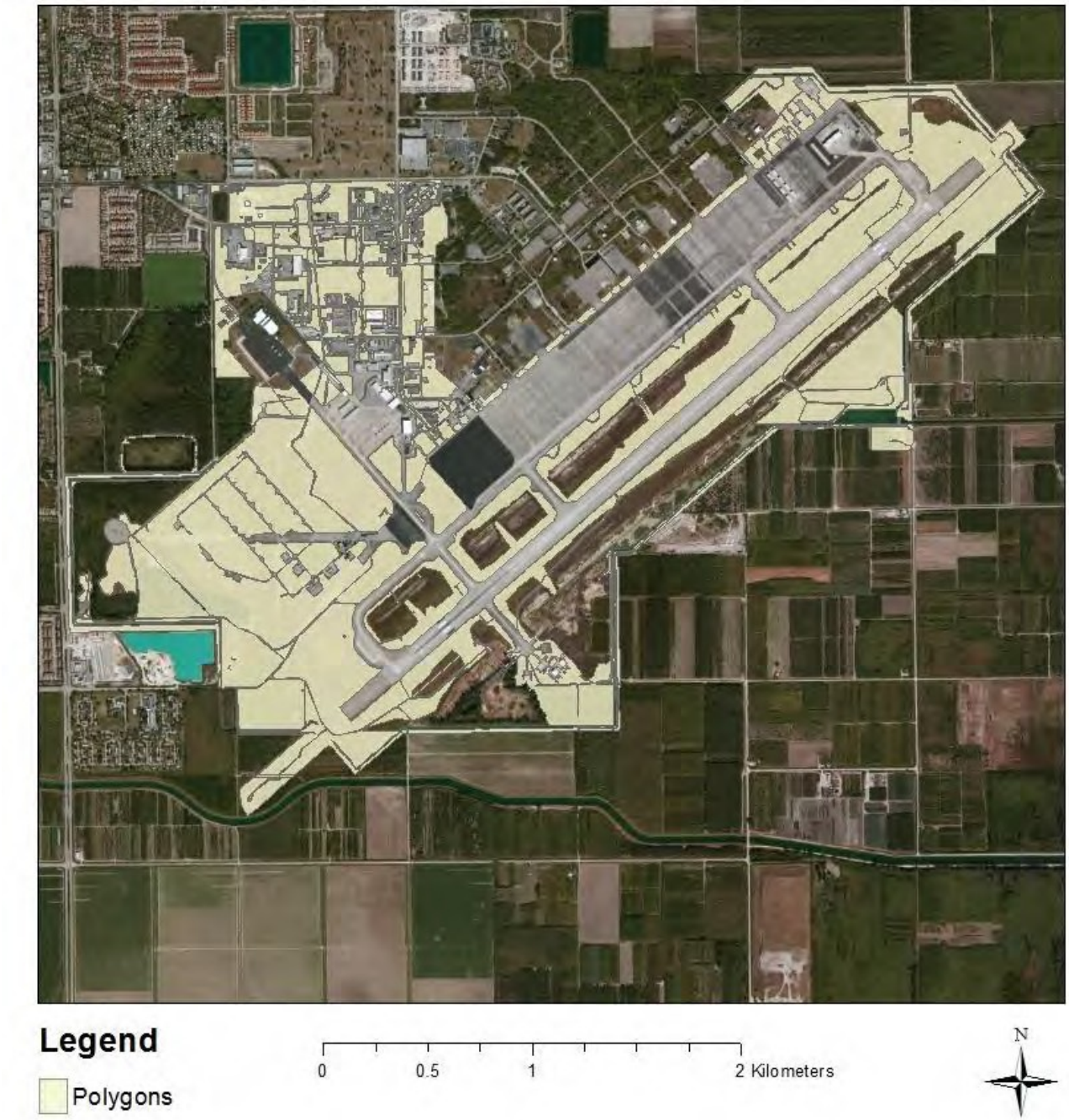


Figure 1. Homestead Air Reserve Base.

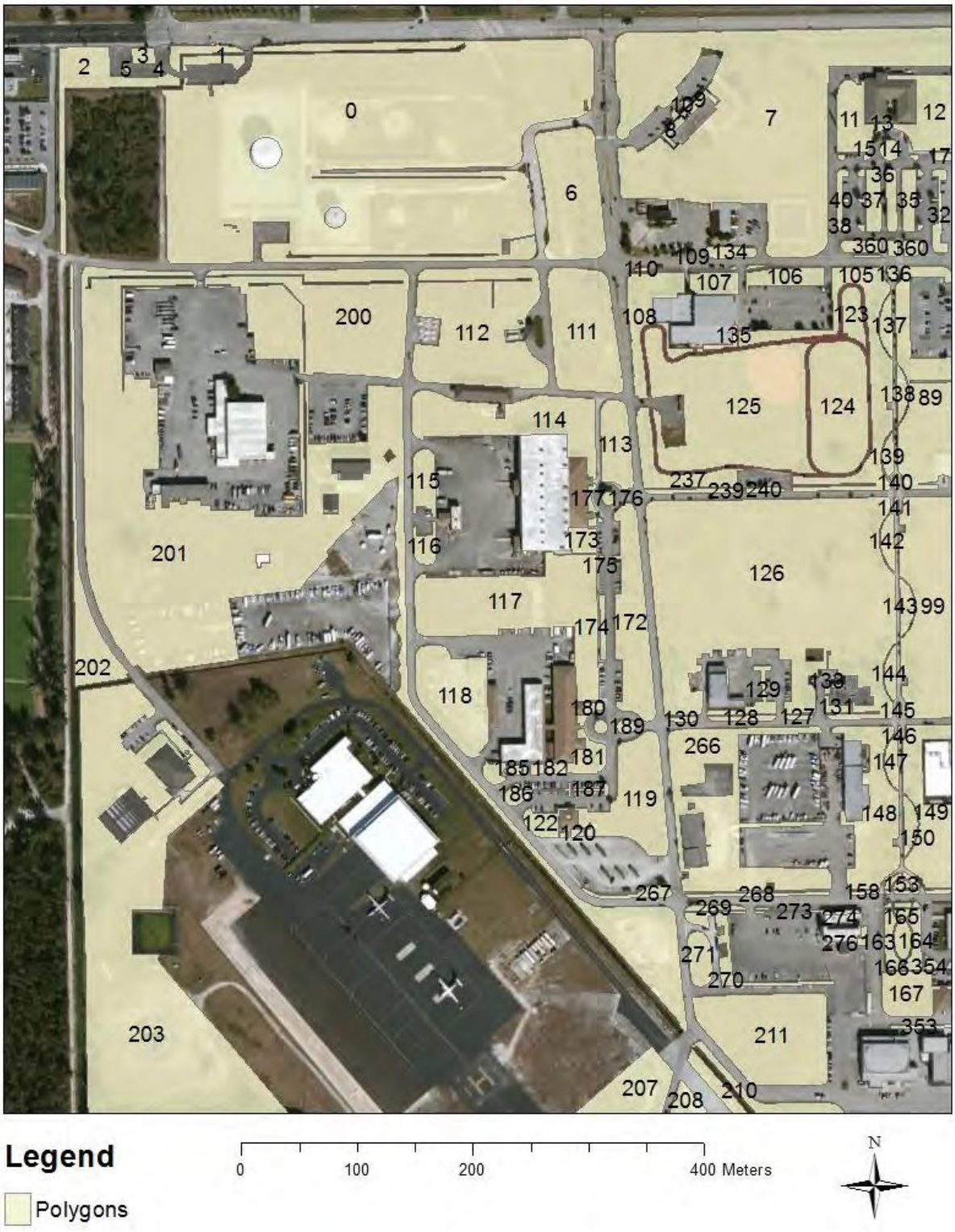


Figure 2. Map showing survey polygon locations.

Figure 3. Map showing survey polygon locations.

Figure 4. Map showing survey polygon locations.

Figure 5. Map showing survey polygon locations.

Figure 6. Map showing survey polygon locations.

Figure 7. Map showing survey polygon locations.

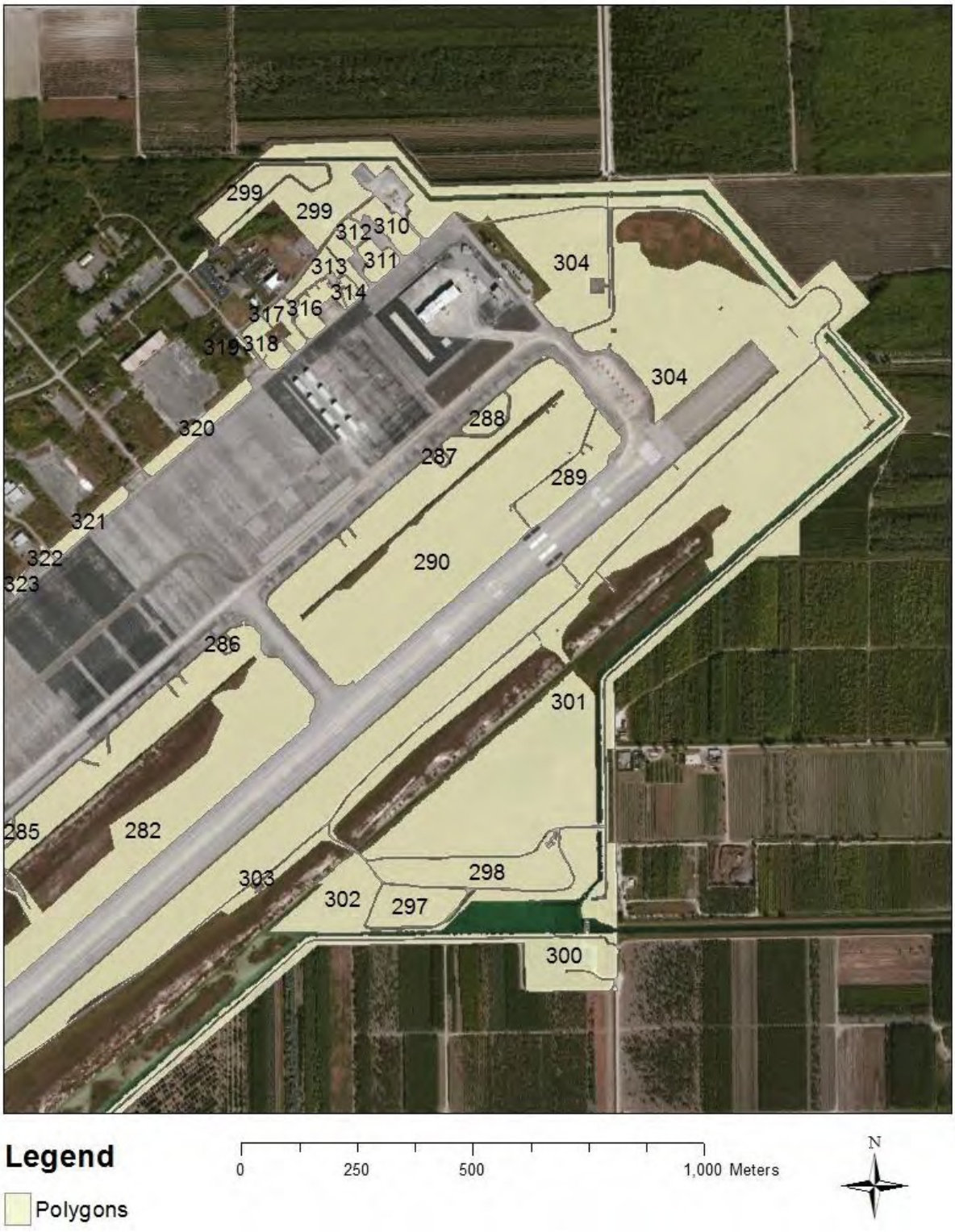


Figure 8. Map showing survey polygon locations.

Figure 9. Map showing survey polygon locations.

Figure 10. Map showing locations of Small's milkpea*:* Polygon 0 showing populations 0, 1, 2, 3, 4, 5, 6 159; Polygon 111 has population 18; Polygon 112 has a single large population 19; Polygon 200 has population 8.

Figure 11. Polygon 7 showing Small's milkpea populations 15, 16, and 17.

Figure 12. Map showing locations of Small's milkpea*:* Polygon 99 showing populations 22 and 23; Polygon 101 showing population 24. Polygon 126 showing populations 20 and 21.

Figure 13. Map showing locations of Small's milkpea*:* Polygon 201 containing populations 8, 9, 11, 12; polygon 202 containing population 10.

Figure 14. Map showing locations of Small's milkpea*:* Polygon 203 contains population 13.

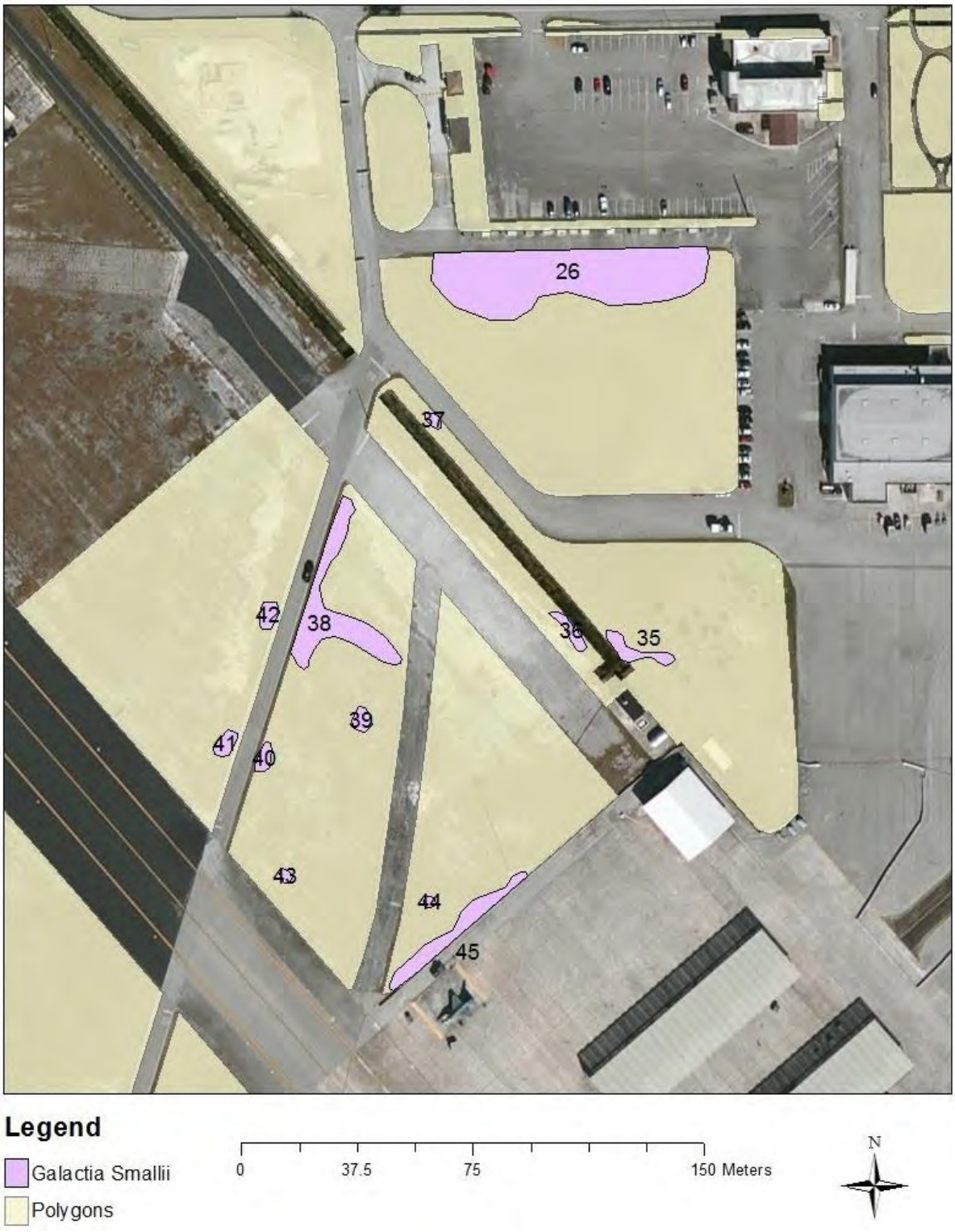


Figure 15. Map showing locations of Small's milkpea*:* Polygon 210 showing populations 35, 36, 37; Polygon 211 showing population 26.

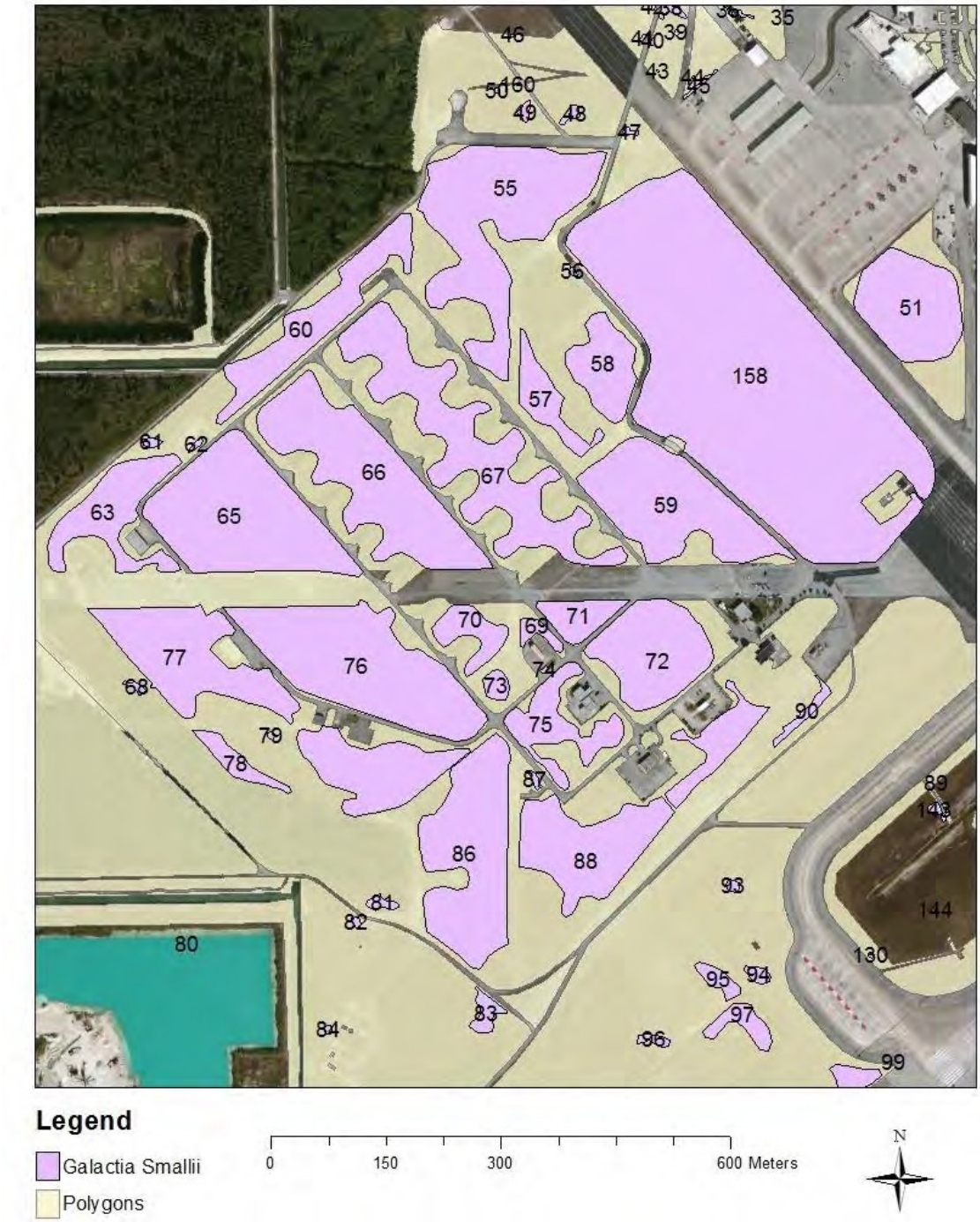


Figure 16. Map showing locations of Small's milkpea*:* Polygon 204 containing populations 46 and 48; Polygon 205 containing populations 49, 50, 160; Polygon 206 showing populations 158 and 47. Polygon 213 showing populations 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 68, 74, 76, 77, 78, 79, 80, 81, 86, 87, 88, 89, 90; Polygon 226 showing population 66; Polygon 226 showing population 66; Polygon 227 showing population 67; Polygon 228 showing population 51; Polygon 253 showing populations 69, 70, 73; Polygon 254 showing population 71; Polygon 255 showing population 72; Polygon 256 showing population 75.

Figure 17. Map showing locations of Small's milkpea*:* Polygon 214 showing population 92; Polygon 216 showing population 91.

Figure 18. Map showing locations of Small's milkpea. Polygon 260 showing populations 93, 94, 95, 96, 97, 98, 100, 101; Polygon 261 showing populations 82, 83, 84, 85; Polygon 262 showing population 161.

Figure 19. Map showing locations of Small's milkpea. Polygon 260 showing population 99; Polygon 294 showing populations 102, 103, 104.

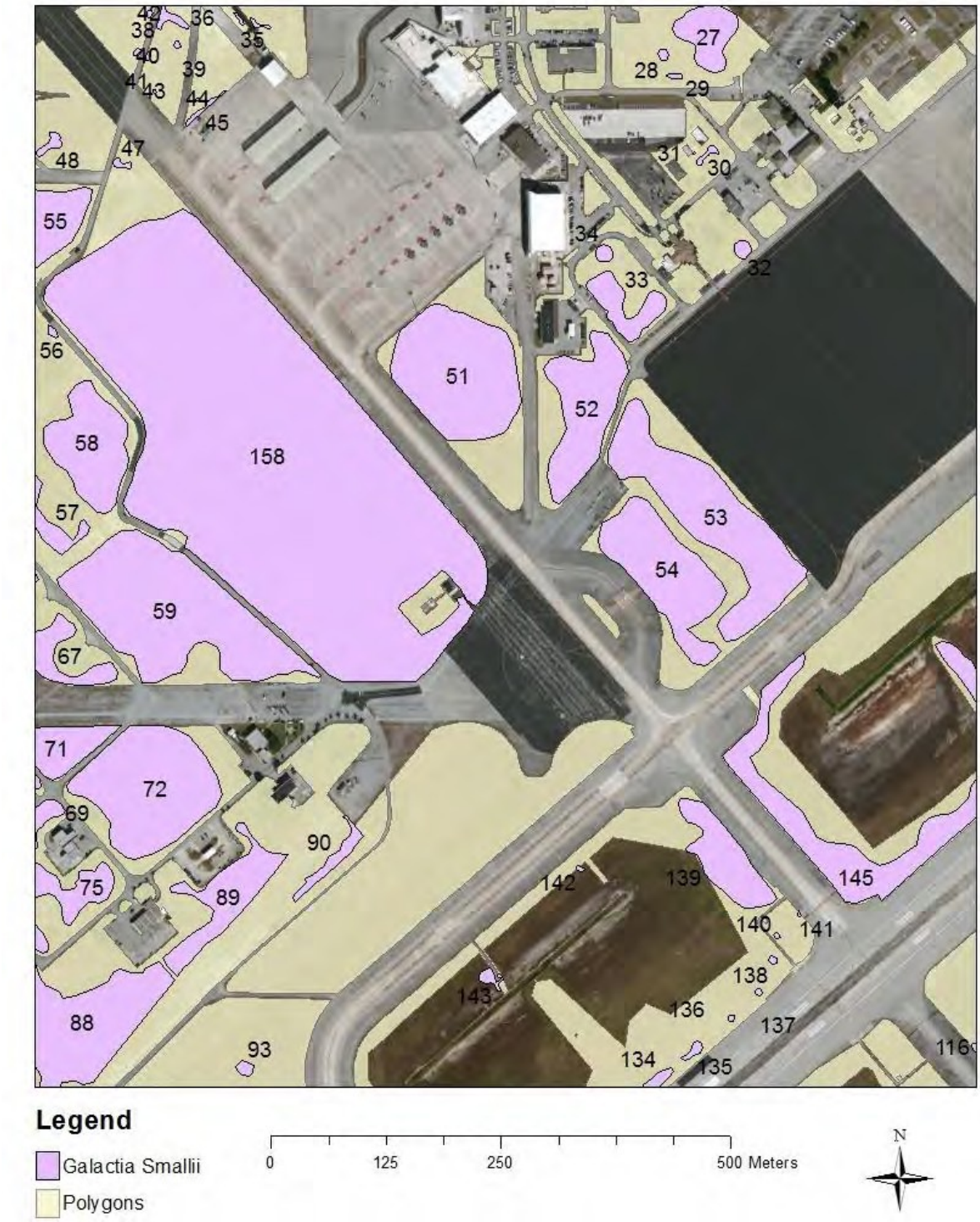


Figure 20. Map showing locations of Small's milkpea*:* Polygon 207 showing populations 41 and 42; Polygon 208 showing populations 38, 39, 40, 43; Polygon 209 showing populations 44 and 45. Polygon 229 showing population 52; Polygon 252 showing populations 53, 54; Polygon 307 showing populations 140, 141; Polygon 344 showing populations 30 and 31.

Figure 21. Map showing locations of Small's milkpea. Polygon 280 showing populations 130, 131, 132 1333, 134, 135, 136, 137, 138, 139, 142, 143, 144; Polygon 281 showing populations 145, 146; Polygon 291 showing populations 105, 106, 107, 108,109, 110, 111, 112, 113, 114; Polygon 296 showing populations 115, 116, 117.

Figure 22. Map showing locations of Small's milkpea. Polygon 281 showing populations 145, 146; Polygon 282 showing populations 147, 148, 149,150, 151, 152 153, 155; Polygon 296 showing population 118; Polygon 304 showing population 119.

Figure 23. Map showing locations of Small's milkpea. Polygon 281 showing populations 154, 155, 156, 157.

Figure 24. Map showing locations of Small's milkpea. Polygon 289 showing population 121; Polygon 304 showing population 120.

Figure 25. Map showing locations of Small's milkpea: Polygon 25 has a single population 25; Polygon 194 with populations 27, 28 29; Polygon 226 showing population 66; Polygon 230 showing populations 33,34; Polygon 277 showing population 32.

Figure 26. Map showing locations of Small's milkpea. Polygon 325 showing population 122; Polygon 327 showing populations 123, 162; Polygon 329 showing populations 124, 125, 126, 127; Polygon 330 showing populations 128, 129.

Figure 27. Map showing locations of sand flax: Polygon 0 showing populations 0 and 30; Polygon 112 contains populations 5 and 6; Polygon 200 contains populations 31, 32 33; Polygon 202 containing population 2.

Figure 28. Map showing locations of sand flax: Polygon 203 showing populations 3and 4.

Figure 29. Map showing locations of sand flax populations: Polygon 203 showing populations 3 and 4; Polygon 204 containing populations 7, 8, 10, 11, 12, 13; Polygon 205 showing populations 15, 37, 16; Polygon 206 showing populations 14 and 29; Polygon 212 showing population 9; Polygon 213 showing populations 17, 18, 19, 23; Polygon 228 showing population 20.

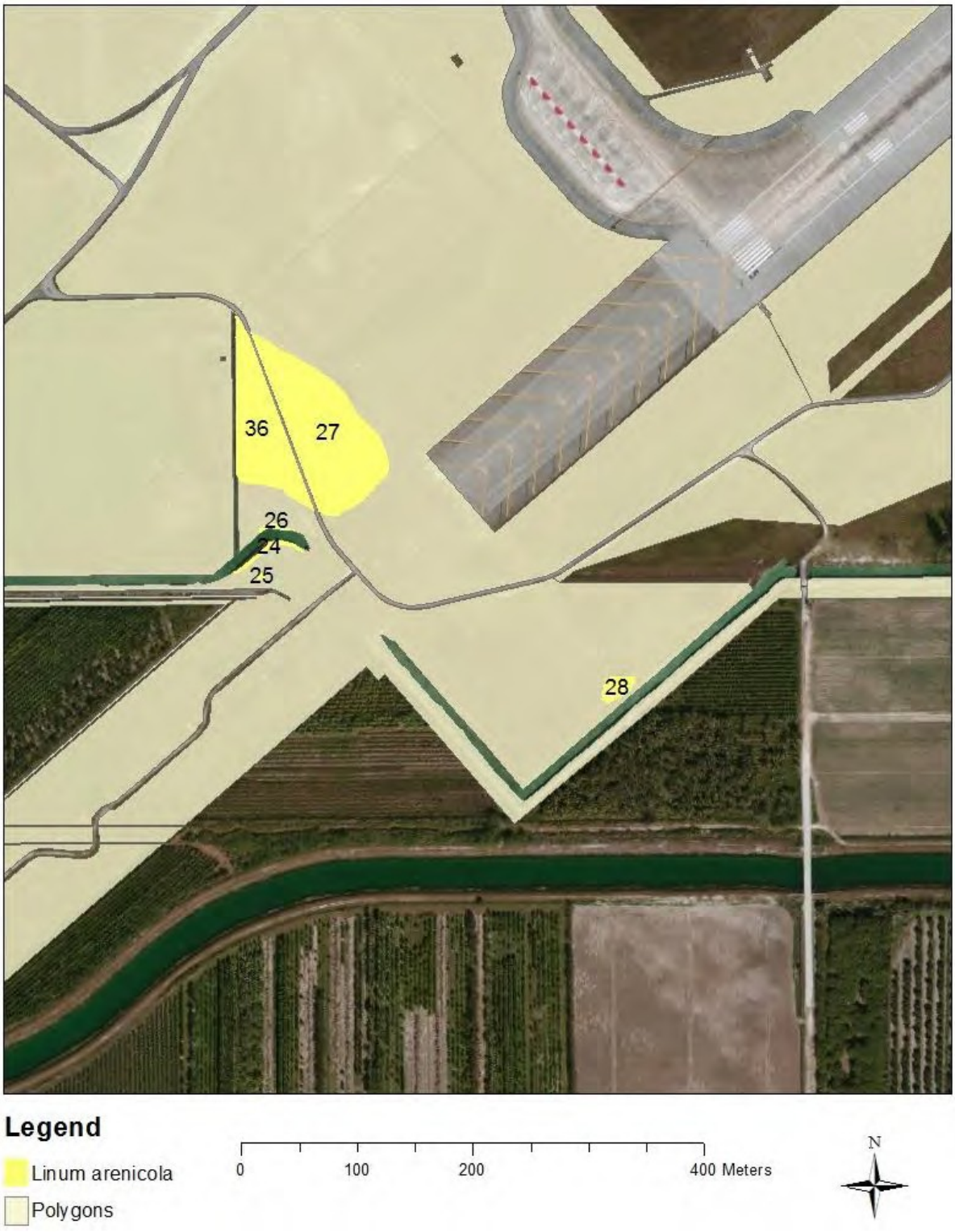


Figure 30. Map showing locations of sand flax: Polygon 260 showing population 27; Polygon 262 showing populations 24, 25, 26, 36; Polygon 294 showing population 28.

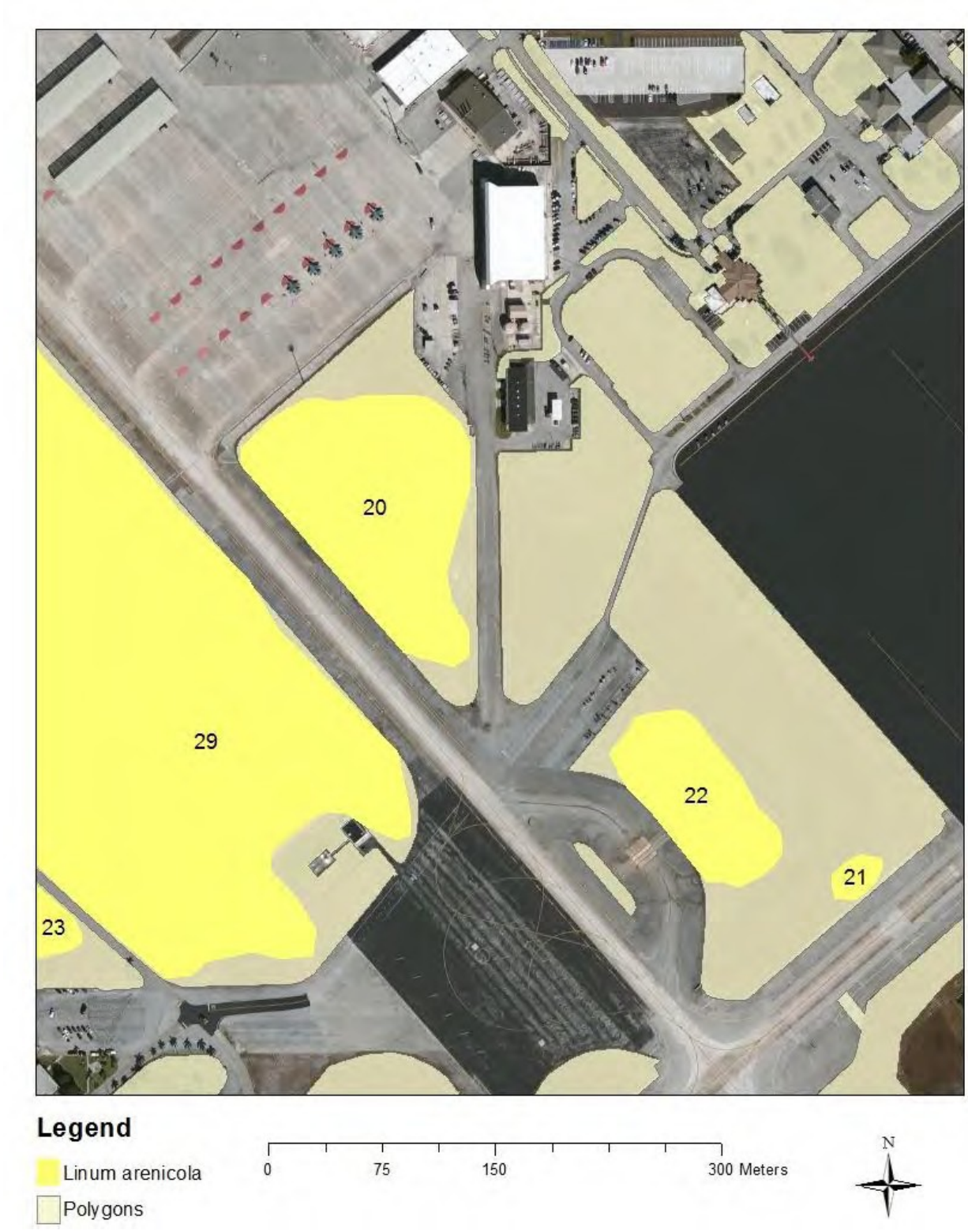


Figure 31. Map showing locations of sand flax: Polygon 252 showing populations 21, 22.

Figure 32. Map showing locations of sand flax: Polygon 214 showing population 35.

Appendix B

Supplemental Tables

TABLE 1
Small's Milkpea and Sand Flax Populations
HARB Protected Plant Management Plan

Survey Polygon	Occurrence	Occurrence acreage	Small's milkpea population	Sand flax population
0	0.1	1.18	2,063	545
	0.2	0.316	384	--
	0.3-0.7	0.174	39	--
	0.8	1.14	646	3,439
6	6.1	0.148	240	--
7	7.1 and 7.3	0.135	48	--
	7.2	0.295	298	--
99	99.1	0.194	Trace	--
	99.2	1.193	2,366	--
101	101.1	0.568	2,391	--
111	111.1	0.039	27	--
112	112.1	1.793	2,902	80
	112.2	0.146	--	43
126	126.1	0.143	77	--
	126.2	0.558	542	--
191	191.1	0.063	68	Trace
194	194.1	0.799	2,700	--
	194.2-194.3	0.047	11	--
200	200.1	1.825	1,848	79
	200.2	0.189	--	111
201	201.1	2.055	2,090	333
	201.2-201.3	0.269	143	--
	201.4	0.918	--	3,046
202	202.1	0.729	11	944
203	203.1	0.229	58	--
	203.2-203.3	0.111	--	85
204	204-1-204.8	0.602	80	194
205	205.1	1.090	110	444
	205.2-205.3	0.586	--	454
206	206.1-206.3	29.372	44,284	13,074
207	207.1-207-.2	0.021	8	--

TABLE 1
Small's Milkpea and Sand Flax Populations
HARB Protected Plant Management Plan

Survey Polygon	Occurrence	Occurrence acreage	Small's milkpea population	Sand flax population
208	208.1-208.4	0.145	79	--
209	209.1-209.2	0.058	86	--
210	210-.1-210.3	0.037	39	--
211	211.1	0.379	919	--
212	212.1	0.043	--	12
213	213.1	8.190	12,671	139
	213.2-213.3	1.317	1,092	--
	213.4	2.037	3,133	--
	213.5	5.873	21,390	444
	213.6-213.8	3.461	3,104	--
	213.9	2.853	2,309	--
	213.10-213.11	7.614	26,234	--
	213.12-213.14	7.976	22,499	--
	213.15	4.822	11,513	--
	213.16	0.644	808	--
	213.17-213.18	3.345	12,355	--
	213.19	0.120	543	--
	213.20	6.225	38,797	--
	213.21-213.22	4.268	13,954	--
	213.23	1.467	1,781	--
	213.24	0.275	278	--
214	214.1	0.901	875	2
216	216.1	1.004	813	Trace
226	226.1	7.288	40,112	--
227	227.1	7.260	17,334	--
228	228.1	4.342	8,056	1,406
229	229.1	2.246	2,363	--
230	230.1-230.2	0.749	2,392	--
252	252.1	4.188	2,712	50
	252.2	2.806	1,135	449
253	253.1	0.291	3,676	--
	253.2	1.047	1,059	--

TABLE 1
Small's Milkpea and Sand Flax Populations
HARB Protected Plant Management Plan

Survey Polygon	Occurrence	Occurrence acreage	Small's milkpea population	Sand flax population
	253.3	0.260	789	--
254	254.1	1.005	5,693	--
255	255.1	3.813	37,649	--
256	256.1	2.107	9,378	--
260	260.1-260.6	1.25	415	--
	260.7	0.878	1,635	--
	260.8-260.9	2.302	9677	4,306
261	261.1-261.4	0.413	36	--
262	262.1	1.407	3,530	1,486
	262.2-262.4	0.107	--	231
277	277.1	0.070	70	--
280	280.1-280.13	1.6	893	--
281	281.1	6.054	8,329	--
	281.2	0.475	865	--
282	282.1-282.11	0.833	530	--
289	289.1	0.133	11	--
291	291.1-291.10	0.099	29	Trace
294	294.1-294.3	2.506	2,091	--
	294.4	0.116	--	6
296	296.1-296.4	0.174	37	--
304	304.1-304.2	0.680	327	--
307	307.1-307.2	0.012	4	--
325	325.1	0.006	13	--
327	327.1-327.2	0.004	14	--
329	329.1-329.4	0.017	47	--
330	330.1-330.2	0.044	27	--
344	344.1-344.2	0.042	61	--

Source: IRC, 2013 (Appendix A)

Note: Populations of Small's milk and sand flax overlapped in several of the survey polygons. The larger population polygon of the two species was reported as the Occurrence

TABLE 2
Distribution of State Listed Species
HARB Protected Plant Management Plan

Common Name	Scientific Name	Survey Polygon
Pineland golden trumpet	*Angadenia berteroi*	6, 112, 200, 201, 202, 203, 206, 207, 212, 213, 214, 227, 260, 262, 280
Pinepink	*Bletia purpurea*	200, 213, 260, 262
Locust berry	*Byrsonima lucida*	201, 202, 213, 260, 261, 262, RPR
White sunbonnets	*Chaptalia albicans*	194, 201, 202, 204, 205, 206, 213, 214, 216, 226, 227, 228, 252, 253, 254, 255, 260, 262, 280, 296
Quail berry	*Crossopetalum ilicifolium*	6, 111, 112, 200, 201, 206, 212, 213, 228, 260, 261, 262, 294
Blodgett's swallowwort	*Cynanchum blodgettii*	213, 214, 260, 262
Small's milkpea	*Galactia smallii*	0, 6, 7, 99, 101, 111, 112, 126, 191, 194, 200, 201, 202, 203,204, 205, 206, 207, 208, 209, 210, 211, 213, 214, 216, 226, 227, 228, 229, 230, 252, 253, 254, 255, 256, 260, 261, 262, 277, 280, 281, 282, 289, 291, 294, 296, 304, 307, 325, 327, 329, 330, 344
Man-in-the-ground	*Ipomoea microdactyla*	206, 213, 228
Pineland cluster vine	*Jacquemontia curtisii*	0, 111, 112, 200, 201, 206, 212, 213, 228, 260, 262, 294, RPR
Rockland shrub verbena	*Lantana depressa*	6, RPR
Sand flax	*Linum arenicola*	0, 6, 112, 191, 200, 201, 202, 203, 204, 205, 206, 212, 213, 214, 216, 228, 252, 260, 262, 294
Pineland black anthers	*Melanthera parvifolia*	260
Wedgelet fern	*Odontosoria clavata*	200, 201
Southern fogfruit	*Phyla stoechadifolia*	112, 203, 212
Long stalked stopper	*Psidium longipes*	0, 6, 112, 200, 201, 202, 206, 212, 213, 227, 260, 262
Bahama ladder brake	*Pteris bahamensis*	6, 112, 200, 201, 202, 210, 213, 214, 216, 227, 260, 261, 262, 294
Small-leaf snoutbean	*Rhynchosia parvifolia*	111, 262, 280
Havana skullcap	*Scutellaria havanensis*	0, 6, 111, 112, 200, 201, 206, 212, 228, 280
Eaton's spike-moss	*Selaginella armata* var. *eatonii*	210, 213, 260, 261, 262, 294
Bahama senna	*Senna mexicana* var. *chapmanii*	202, 213, 214, 260, 261, 262

TABLE 2
Distribution of State Listed Species
HARB Protected Plant Management Plan

Common Name	Scientific Name	Survey Polygon
Everglades greenbrier	*Smilax havanensis*	6, 112, 200, 201, 202, 213, 260, 262
Everglades false buttonweed	*Spermacoce terminalis*	0, 6, 112, 200, 201, 206, 207, 209, 212, 213, 227, 256, 260, 262
Everglades key pencilflower	*Stylosanthes calcicola*	0, 201, 205, 206, 213, 228, 260, 262
Florida clover ash	*Tetrazygia bicolor*	0, 202, 213, 260, RPR

RPR – Remnant Pine Rockland

Source: IRC, 2013 (Appendix A) and Golder Associates Inc, 2012

Appendix C

AFPMB Standard Pesticides List Available to DoD Components and Agencies

ARMED FORCES PEST MANAGEMENT BOARD (AFPMB) STANDARD PESTICIDES LIST AVAILABLE TO DOD COMPONENTS AND AGENCIES

October 1, 2013

This list contains pesticides that the Armed Forces Pest Management Board (AFPMB) has approved for DLA/DSCR stockage. DoD policy (DoD Instruction 4150.07) requires that the use of most of these pesticides whether procured from DLA or locally, must be pre-approved by a professional pest management consultant. This is usually done when the consultant approves the Installation's pest management plan. DoD policy also requires that only trained and certified applicators may apply pesticides on DoD installations. Only authorized personnel should procure and use these pesticides. Note: For Contingencies, see the Contingency Pesticide List and AFPMB Technical Guide 24. Changes on List are highlighted in bold red..

NSN 6840-	Item (Alternative Trade Name)	Unit Package	AAC *	Price	Unit Issue	Users+

Table of Contents

1. HERBICIDES/FUNGICIDES/ALGACIDES						
The following herbicides must be applied by a DoD certified pesticide applicator or under the direct supervision of a DoD Certified pesticide applicator.						
01-360-4741 MSDS Label	Fungicide, Methylisothiocyanate (MITC-FUME) ***RESTRICTED USE PESTICIDE***	18 tubes	J	**47.99**	CO	A, N, F, M
01-457-6588 MSDS Label	Fungicide, Methyl Azoxystrobin, 50% (Heritage)	(6) 1- lb. cont.	H	**6700.10**	BX	A, N, F, M
01-561-9603 MSDS Label	Herbicide, Aminopyralid, 40.6% (Milestone VM)	(2) 2.5-gal co	J	**2221.61**	BX	A, N, M, F
00-392-7593 MSDS Label	Herbicide, Bromacil, 21.9% lithium salt of bromacil, liquid (Hyvar X-L)	(4) 1-gal co	H	**517.02**	BX	A, F, M
01-408-9079 MSDS Label	Herbicide, Bromacil, 80%, wettable powder (Hyvar X)	(12) 4-lb bags	H	**2322.20**	BX	A, M
01-005-7523 MSDS Label	Herbicide, Diquat, 35.3%, water soluble liquid (Reward)	1-gal co	H	**487.40**	GL	F
00-815-2799 MSDS Label	Herbicide, Diquat, 35.3%, water soluble liquid (Reward)	(2) 2.5-gal co	H	**1074.96**	BX	A, N, F
01-341-9346 MSDS Label	Herbicide, Diuron, mínimum 80% diuron, granular	25-lb bag	H	**267.28**	BG	A, N, F, M
00-001-7710 MSDS Label	Herbicide, Diuron-Bromacil mixture, 40% bromacil, 40% diuron, granular (Krovar I DF)	6-lb bag	H	**132.40**	BG	A, N, F, M
01-356-6001 MSDS Label	Herbicide, Fluridone, 5%, pellets (Sonar SRP)	40-lb co	J	**660.12**	CO	A, N
01-356-8888 MSDS Label	Herbicide, Fluridone 41.7% liquid (Sonar A.S.)	1 qt co	H	**1196.38**	QT	A, N
01-525-5869 MSDS Label	Herbicide, Imazapic ammonium salt 23.6% liquid (Plateau)	(2) 1-gal co	J	**1458.00**	BX	A, N, M, F
01-108-9578 MSDS Label	Herbicide, Isopropylamine salt of glyphosate, 41%, water soluble liquid (Roundup Pro/Ranger Pro/Razor Pro/Glyfos Pro)	(2) 2.5-gal co	H	**193.72**	BX	A, N, F, M
01-388-0142 MSDS Label	Herbicide, Isopropylamine salt of glyphosate, 41%, water soluble liquid (Roundup Pro/Ranger Pro/Razor Pro/Glyfos Pro)	30-gal drum	H	**1210.76**	DR	A, F
01-356-8893	Herbicide, Isopropylamine salt of glyphosate, 53.8%, water soluble	(2) 2.5-gal co	H	**444.76**	BX	A, F, M

October 1, 2013

NSN 6840-	Item (Alternative Trade Name)	Unit Package	AAC *	Price	Unit Issue	Users+
MSDS Label	liquid (Rodeo/Aquamaster)					
01-377-7113 MSDS Label	Herbicide, Isopropylamine salt of glyphosate, 2.0%, water soluble liquid (Roundup Ready-to-Use)	24-oz pump spray bottle	H	9.20	BT	N, F
01-399-0673 MSDS Label	Herbicide, Ammonium salt of glyphosate, 73.3% and 2.9% Diquat dibromide, water soluble liquid (Quik Pro)	5 pkg.	H	23.47	BX	A,F, M
01-545-4540 MSDS Label	Herbicide, Ammonium salt of glyphosate, 73.3% and 2.9% Diquat dibromide, water soluble liquid (Quik Pro)	6.8 lb co	H	257.29	CO	A, N, M, F
01-356-8902 MSDS Label	Herbicide, Isopropylamine salt of imazapyr, **26.7% (Arsenal Powerline)**	(2) 2.5-gal co	H	2960.62	BX	A, N, F, M
01-532-5403 MSDS Label	Herbicide, Isopropylamine salt of imazapyr, 28.7% (Habitat)	(2) 2.5-gal co	H	2285.35	BX	A, N, F, M
01-318-7417 MSDS Label	Herbicide, Oryzalin, 40.4% (Surflan A.S.)	1-gal bot	H	407.27	GL	A, N, F, M
00-145-0013 MSDS Label	Herbicide, Prometon, 25% prometon, emulsifiable concentrate (Pramitol 25E)	(2) 2.5-gal co	H	313.01	BX	A, F
01-356-8891 MSDS Label	Herbicide, Methyl Sulfometuron, 75% (Oust XP)	48-oz co	H	656.46	CO	A, N, F, M
01-319-2890 MSDS Label	Herbicide, Tebuthiuron (Spike 80 DF)	4-lb bag	L	173.76	BG	A, N, F, M
01-457-6576 MSDS Label	Herbicide, Tebuthiuron-Diuron, 1% Tebuthiuron, 3% Diuron (Spraykil SK-13)	40 lb. container	H	234.13	CO	A, N, F, M
01-552-1822 MSDS Label	Herbicide, Triclopyr, 60.45% (Garlon 4 Ultra)	(2) 2.5-gal co	H	707.87	BX	A, N, M, F
00-577-4194 MSDS Label	Herbicide, 2,4-Dichlorophenoxy-acetic acid (2,4-D), oil miscible/water emulsifiable liquid (low volatile ester form)	(2) 2.5-gal co	H	205.40	BX	A, N, F, M
00-664-7060 MSDS Label	Herbicide, 2,4-Dichlorophenoxy-acetic acid (2,4-D), water soluble liquid (amine salt form)	(2) 2.5-gal co	H	147.65	BX	A, N, M
01-377-7110 MSDS Label	Herbicide, 2,4-Dichlorophenoxy-acetic acid (2,4-D), 0.128%, 0.22% MCPP and 0.05% Dicamba water soluble liquid (Weed-B-Gon MAX)	24-oz pump spray bottle	H	11.96	BT	F
2. REPELLENTS						
The following repellents must be applied by trained personnel or a DoD certified pesticide applicator.						
01-334-2666 MSDS Label	Insect Repellent, clothing application, 40% permethrin, liquid (2-Gal sprayer)	(12) 151-ml bot	H	154.97	BX	A, N, F, M
All DoD personnel following label and MSDS familiarization may apply the following repellents.						
01-284-3982 MSDS Label	Insect Repellent, personal application, Ultrathon (3M/EPA 58007-1)	(12) 2-oz tubes	H	98.52	BX	A, N, F, M
01-278-1336 MSDS Label	Insect Repellent, clothing application, aerosol (Permethrin Arthropod Repellent)	(12) 6-oz cans	H	82.00	BX	A, N, F, M
01-137-8456 MSDS Label	Insect Repellent, personal application, 3% benzocaine, 10% precipitated sulfur (Chigg-Away)	118-ml bot	H	6.70	BT	A, N, F, M
01-288-2188 MSDS Label	Insect Repellent, personal application & sunscreen, 20% DEET/SPF15 (Sunsect)	(12) 2-oz tubes	H	79.28	BX	A, N, F
01-452-9582 MSDS Label	Insect Repellent, personal application & sunscreen, 20% DEET/SPF15 (Sunsect)	320 packets	H	439.26	BX	A, N, F
01-493-7334 MSDS Label	Insect Repellent, personal application & camouflage face paint (CFP w/ DEET)	12 compacts/box	V	152.66	BX	A, N, F, M
01-345-0237 MSDS Label	Insect Repellent, clothing application, permethrin (IDA)	12 kits	H	60.86	BX	A, N, F, M
01-584-8393 MSDS Label	Insect Repellent, personal application, 30% DEET (SP532-Ultra30/LippoDEET)	(12)-2 oz tubes	H	75.71	BX	A, N, M, F
01-584-8598 MSDS Label	Insect Repellent, personal application, 23% DEET , pump spray bottles(Cutter Backwoods DEET Insect Repellent)	(12)-6 oz BT	H	77.94	BX	A, N, F, M
01-619-4795 MSDS Label	**Insect Repellent, personal application, 20% Picaridin, pump spray bottle (NATRAPEL Insect Repellent)**	**(12)-3.5 oz BT**	**Z**	**41.55**	**BX**	**A, N, M, F**

October 1, 2013

NSN 6840-	Item (Alternative Trade Name)	Unit Package	AAC *	Price	Unit Issue	Users+
01-602-8388	Insect Repellent, personal application & camouflage face paint (Stick w/ DEET), sand & loam colors	6 sticks/box	Y	37.40	BX	A, N, F, M
01-602-8387	Insect Repellent, personal application & camouflage face paint (Stick w/ DEET), green & sand colors	6 sticks/box	Y	37.40	BX	A, N, F, M
01-602-8370	Insect Repellent, personal application & camouflage face paint (Stick w/ DEET), black & green colors	6 sticks/box	Y	37.40	BX	A, N, F, M
01-602-8300	Insect Repellent, personal application & camouflage face paint (Stick w/ DEET), white & loam colors	6 sticks/box	Y	37.40	BX	A, N, F, M
01-602-8363	Insect Repellent, personal application & camouflage face paint (Stick w/ DEET), green & loam colors	6 stick/box	Y	37.40	BX	A, N, F, M
	3. INSECTICIDES					
	The following insecticides must be applied by a DoD certified pesticide applicator or under the direct supervision of a DoD Certified pesticide applicator.					
01-543-0662 MSDS Label	Insecticide, Abamectin, 0.011%, (Advance 360A Dual Choice Ant Bait Stations)	72 bait stations	H	86.42	BX	A, N, M, F
01-561-9766 MSDS Label	Insecticide, Abamectin, 0.05% (Avert Dry Flowable Cockroach Bait Formula 1)	12-30 gram tubes	H	391.01	BX	A, N, M, F
01-561-9649 MSDS Label	Insecticide, Abamectin, 0.05% (Avert Cockroach Bait Stations Formula 1)	4 bags. Each bag contains 72 bait stations	H	294.19	BX	A, N, F, M
00-145-0016 MSDS Label	Insecticide, Aluminum phosphide, 55 % tablets (Phostoxin/Fumitoxin) ***RESTRICTED USE PESTICIDE***	100 tablets	H	40.52	CN	A, N, F
00-442-5698 MSDS Label	Insecticide, Aluminum phosphide, 55 % pellets (Phostoxin/Fumitoxin) ***RESTRICTED USE PESTICIDE***	1660 pellets	H	73.38	BT	A, N, F, M
01-377-7049 MSDS Label	Insecticide, *Bacillus thuringiensis*, 10% (Summit BTI. Briquets)	100 Briquets	H	129.40	BX	A, N, F, M
01-565-8241 MSDS Label	Insecticide, *Bacillus thuringiensis(Vectobac WDG)*	24-1 lb bags/CO	H	1331.22	CO	A, N, M, F
01-287-3938 MSDS Label	Insecticide, Boric Acid, aerosol (Perma-Dust PT 249)	(12) 9 oz cans	V	117.55	BX	A, N, F, M
01-525-6888 MSDS Label	Insecticide, Bifenthrin, 7.9% liquid (**Talstar P Professional**)	1-qt co	H	66.25	QT	A, N, M, F
00-932-7297 MSDS Label	Insecticide, Carbaryl, 80%, water dispersible powder **(**Sevin 80S/AllPro Carbaryl 80S)	(5) 10-lb bags	Z	602.05	BX	A, N, F
01-104-0887 MSDS Label	Insecticide, Carbaryl, 43.4%, liquid (Carbaryl 4L)	(2) 2.5-gal co	H	403.82	BX	F
01-525-7139 MSDS Label	Insecticide, Chlorfenapyr, 21.45% liquid (Phantom)	(4) 75-oz co	H	1051.88	BX	A, N, F, M
01-313-7359 MSDS Label	Insecticide, beta-cyfluthrin, 11.8% (Tempo SC Ultra)	(12) 240-ml bot	H	627.41	BX	A, N, F, M
01-383-6251 MSDS Label	Insecticide, beta-cyfluthrin, 10% (Tempo Ultra WSP)	(32) 50 gm packs	H	449.59	BX	A, N, F, M
01-561-9717 MSDS Label	Insecticide, Cyfluthrin, 0.1%, aerosol (PT CY-KICK)	12 x 17.5 oz cans/box	H	164.87	BX	A, M, F, N
01-561-9669 MSDS Label	Insecticide, Lambda-cyhalothrin, 0.05% aerosol (PT 221L Residual)	12 x 17.5 oz cans/box	H	154.62	BX	A, M, N, F
01-390-4822 MSDS Label	Insecticide, Cypermethrin, 40% (Demon WP)	1-lb jar	H	82.29	LB	A, N, F, M
01-573-5024 MSDS Label	Insecticide, Deltamethrin, 0.03% (Kills Bedbugs II)	(4) 1- gal jugs	Z	98.68	BX	A,N,F, M
01-431-3345	Insecticide, Deltamethrin, 0.05% (Delta Dust)	1-lb co	H	16.30	LB	A, N, F,

ARMED FORCES PEST MANAGEMENT BOARD (AFPMB) STANDARD PESTICIDES LIST AVAILABLE TO DOD COMPONENTS AND AGENCIES

October 1, 2013

NSN 6840-	Item (Alternative Trade Name)	Unit Package	AAC *	Price	Unit Issue	Users+
MSDS Label						M
01-561-9745 MSDS Label	Insecticide, Deltamethrin, 0.06%, aerosol (D-Force Residual)	8 x 14 oz cans/box	H	**143.00**	BX	A, N, M, F
00-142-9438 MSDS Label	Insecticide, Dichlorvos, 20% (plastic strips)	48 strips	V	**229.91**	BX	A, N, F, M
01-603-5650 MSDS Label	Insecticide, Dichlorvos, 20% (NUVAN PROSTRIPS + 65 Gram)	6 packs per box (3 strips per pack)	Z	**438.12**	BX	A, N, M, F
01-603-5654 MSDS Label	Insecticide, Dichlorvos, 20% (NUVAN PROSTRIPS 16 Gram)	6 packs per box (12 strips per pack)	J	**519.38**	BX	A, N, M, F
01-412-4634 MSDS Label	Insecticide, D-Phenothrin, 2%, aerosol	12-oz can	H	**16.79**	CN	A, N, F, M
66-131-2263	**Insecticide, D-Phenothrin 2% and Permethrin 2% (Callington 1-Shot Aircraft Insecticide) ***TEMPORARY USE PESTICIDE*** For use in Disinsection of Aircraft Cargo Holds**	**150 gram can**	**D**	**16.00**	**CN**	**N, F**
01-586-8718 MSDS Label	Insecticide, Allethrin-Permethrin Mixture 0.25% and 0.15% , aerosol (Ace House & Garden Bug Killer 2)	15-oz can	D	**7.60**	CN	A, N, M, F
01-067-2137 MSDS Label	Insecticide, D-trans Allethrin and Resmethrin, 0.125% and 0.2% , aerosol (Kill Zone House & Garden Insect Killer Formula 4)	14-oz can	V	**3.68**	CN	A, N, F, M
01-573-4964 MSDS Label	Insecticide, Etofenprox, 20% (Zenivex E20)	(2) 2.5-gal co	H	**2837.12**	BX	A,N,M
01-619-6396 MSDS Label	**Insecticide, Etofenprox 1.0%; Tetramethrin 0.5% and Piperonyl Butoxide 1.5% (ZENPROX Aerosol)**	**(6) 16-oz cans**	**Z**	**51.04**	**BX**	**A,N,F, M**
01-183-7244 MSDS Label	Insecticide, Methomyl, 1.1%, Fly bait (Golden Malrin/Stimukil)	5-lb can	H	**21.50**	CN	A, N, F, M
01-287-3913 MSDS Label	Insecticide, Hydramethylnon (Amdro Fire Ant Bait; **PROBAIT Fire Ant Bait)**	(24) 6-oz bot	H	**606.83**	BX	A, N, F, M
01-501-2905 MSDS Label	Insecticide, Hydroprene, 90.6% (Gentrol Point Source)	20 devices/box	H	**51.25**	BX	A, M, N
01-585-9976 MSDS Label	Insecticide, Hydroprene, 0.36%(Gentrol Aerosol)	(12) 16 –oz cans	H	**157.89**	BX	A, N, M F
01-424-2494 MSDS Label	Insecticide, Fenoxycarb (Award Brand of Logic)	25-lb bag	H	**441.90**	BG	A, N, F, M
01-585-9950 MSDS Label	Insecticide, Fipronil, 0.0143% (Top Choice Fire Ant Granules) ***RESTRICTED USE PESTICIDE***	50-lb bag	H	**358.80**	BG	A, N, M, F
01-224-1269 MSDS Label	Insecticide, Fipronil, cockroach, large size (Combat Source Kill Max R2)	8 bait stations/ box/ 12 boxes	H	**168.90**	PG	A, N, F, M
01-180-0167 MSDS Label	Insecticide, Fipronil, cockroach, regular size (Combat Source Kill Max R1)	12 bait stations/ box/ 12 boxes	H	**150.95**	PG	A, N, F, M
01-483-3065 MSDS Label	Insecticide, Fipronil (Maxforce FC Roach Killer Bait Gel)	24-60 gram reservoirs/ box	H	**345.80**	BX	A, N, M
01-471-5650 MSDS Label	Insecticide, Fipronil (Maxforce FC Roach Killer Bait Gel)	4-30 gram reservoirs/box	H	**28.38**	BX	A, N, M
01-500-4579 MSDS Label	Insecticide, Fipronil (Maxforce FC Ant Killer Bait Gel)	4 reservoirs/box	H	**33.36**	BX	A, N, M, F
01-602-8269 MSDS Label	Insecticide, Fipronil (Maxforce FC Magnum Roach Killer Bait Gel)	12-33 gram reservoirs per box	H	**170.16**	BX	A, N, M, F
01-298-1122 MSDS Label	Insecticide, Fipronil (MaxForce FC Ant Bait)	96 stations	H	**122.35**	PG	A, N, F, M
01-483-3072 MSDS Label	Insecticide, Fipronil (Termidor 80WG)	24 co/box	H	**3980.84**	BX	A, N, M
01-483-3068 MSDS Label	Insecticide, Fipronil (Termidor SC)	4-78 oz BT/box	H	**1318.63**	BX	A, N, M
01-318-7416 MSDS Label	Insecticide, Hydroprene, 9.0%, emulsifiable concentrate (Gentrol IGR)	(10) 1-oz bot	H	**81.14**	BX	A, N, F, M
01-591-2150 MSDS Label	Insecticide, Imidacloprid (Temprid SC)	400 ml CO	H	**147.90**	CO	A,N, F, M

ARMED FORCES PEST MANAGEMENT BOARD (AFPMB) STANDARD PESTICIDES LIST AVAILABLE TO DOD COMPONENTS AND AGENCIES

October 1, 2013

NSN 6840-	Item (Alternative Trade Name)	Unit Package	AAC *	Price	Unit Issue	Users+
01-518-5807 MSDS Label	Insecticide, Imidacloprid (Maxforce Granular Fly Bait)	5 lb co	H	**50.53**	CO	A, N, F, M
01-555-9369 MSDS Label	Insecticide, Imidacloprid (Maxforce Fly Spot Bait)	(50) 2 oz pkg/box	H	**396.97**	BX	A, N, M, F
01-457-6580 MSDS Label	Insecticide, Imidacloprid, 0.5% granular (Merit 0.5 g)	30 lb. bag	H	**228.86**	BG	A, N, F, M
01-428-6646 MSDS Label	Insecticide, Lambda-cyhalothrin, 9.7% (Demand CS)	(8) 8 oz bottle	H	**487.40**	BX	A, N, F, M
01-431-3357 MSDS Label	Insecticide, Lambda-cyhalothrin (Surrender Pesttab)	40 tablets	H	**72.73**	CO	A, N, F, M
00-655-9222 MSDS Label	Insecticide, Malathion, 57.0%, emulsifiable concentrate, class 2	1-gal co	H	**64.27**	GL	A, N, F, M
00-685-5438 MSDS Label	Insecticide, Malathion, 57.0%, emulsifiable concentrate, class 2	5-gal can	H	**290.53**	CN	A, N, F, M
00-926-1481 MSDS Label	Insecticide, Malathion, 96.5%, liquid, (Fyfanon ULV)	54-gal drum	H	**4018.39**	DR	A, N, F, M
01-169-1842 MSDS Label	Insecticide, Malathion, 96.5%, liquid, (Fyfanon ULV)	5-gal can	H	**350.50**	CN	A, N, F, M
01-424-2495 MSDS Label	Insecticide, Methoprene (Altosid XR Briquets)	220 Briquettes	H	**1179.56**	BX	A, N, F, M
01-511-0535 MSDS Label	Insecticide, Methoprene (Altosid Pellets)	(2) 22 lb co/box	H	**2182.38**	BX	A, N, F, M
01-424-2493 MSDS Label	Insecticide, Methoprene (Altosid Liquid Larvicide Conc.)	(2) 2.5-gal co	H	**9250.68**	BX	A, N, F, M
01-591-2155 MSDS Label	Insecticide, Methoprene (Precor 2000 Plus)	12 aerosols/box	H	**222.49**	BX	A, N, M, F
01-270-9765 MSDS Label	Insecticide, Naled, 87.4, liquid (Dibrom)	30-gal drum	H	**7613.95**	DR	A, F
01-532-5414 MSDS Label	Insecticide, Naled, 78%, liquid (Trumpet EC)	30-gal drum	J	**5475.14**	DR	A, N, F, M
00-597-6111 MSDS Label	Insecticide, Naphthalene, ball form	14-oz box	H	**7.25**	BX	A, N, F, M
01-467-0994 MSDS Label	Insecticide, Nithiazine, Fly Strips (Quikstrike), 2 strips per package	(12) PG/box	H	**262.60**	BX	A, N, F
00-174-1825 MSDS Label	Insecticide, P-Dichlorobenzene, crystal/flake	100-lb drum	J	**390.00**	DR	A, N, F
00-174-1824 MSDS Label	Insecticide, P-Dichlorobenzene, crystal **GSA**	1-lb can	J	17.04	LB	N, F, M
01-606-8581 MSDS Label	Insecticide, Permethrin-Piperonyl Butoxide (20.6+ 20.6%), All Pro Aqualuer 20-20	(2)-2.5 gal co/box	J	**1313.26**	BX	A, N, F, M
01-550-5660 MSDS Label	Insecticide, Permethrin-Piperonyl Butoxide (4.6+4.6%) , (Kontrol 4-4)	(2) 2.5-gal co	H	**333.40**	BX	A, N, F, M
01-104-0780 MSDS Label	Insecticide, Pyrethrins, 3% pyrethrins with synergists, liquid (ULV fog concentrate)	1-gal bot	H	**222.08**	GL	A, N, F, M
00-459-2443 MSDS Label	Insecticide, Phenothrin 0.120% and Allethrin 0.129%, aerosol (Wasp-Freeze Wasp & Hornet Killer)	(12) 17.5-oz cans	H	**114.36**	BX	A, N, F, M
01-619-6467 MSDS Label	**Insecticide, Etofenprox 0.50%; Tetramethrin 0.2% and Piperonyl Butoxide 1.0% (Zoecon Wasp-X Wasp and Hornet Spray)**	**(12) 16-oz cans**	**Z**	**74.01**	**BX**	**A, N, F, M**
00-823-7849 MSDS Label	Insecticide, Pyrethrin, aerosol (PT 565 Plus XLO)	(12) 20-oz cans	H	**241.14**	BX	A, N, F
01-359-8533 MSDS Label	Insecticide, Resmethrin (Scourge) *****RESTRICTED USE PESTICIDE*****	5-gal can	H	**757.18**	CN	A, N, F
01-457-6583 MSDS Label	Insecticide, Spinosad, 11.6% (Conserve SC)	1 qt co	H	**218.54**	QT	A, N, F, M
01-474-7751 MSDS Label	Insecticide, Sumithrin-Piperonyl Butoxide, 10%-10%, (Anvil 10+10 ULV)	(2) 2.5-gal/box	H	**2334.52**	BX	A, M, F, N
01-474-7706 MSDS Label	Insecticide, Sumithrin-Piperonyl Butoxide, 10%-10%, (Anvil 10+10 ULV)	250 gal co	J	----------	CO	A, N, F, M
01-424-3132 MSDS Label	Insecticide, Temephos (Abate 4E**;** ALLPRO Provect 4E Larvicide)	2.5-gal co	H	**1567.16**	CO	A, N, F, M
01-498-9270 MSDS Label	Insecticide, Temephos (5% Skeeter Abate; ALLPRO Provect 5G Larvicide)	2-22 lb co	H	**282.18**	EA	A, F

October 1, 2013

NSN 6840-	Item (Alternative Trade Name)	Unit Package	AAC *	Price	Unit Issue	Users+
01-467-1029 MSDS Label	Mosquito Larvicide and Pupicide (Agnique MMF)	(2) 2.5-gal co	Y	347.62	BX	A, N, F

4. EPA 25 (b) EXEMPT PESTICIDE PRODUCTS						
The following are EPA 25(b) exempt pesticides that have been approved by the AFPMB for stock listing.						
01-606-9951 MSDS Label	Insecticide, Geraniol, 1.3%; aerosol (Terminix Natural Pest Control Flying Insect Killer)	(6) 14 oz cans	J	51.94	BX	A, N, F, M
01-607-0000 MSDS Label	Insecticide, Thyme Oil, 4.1%; (TyraTech Tech Dust Natural Insecticide)	10 lb. pail	J	88.29	CO	A, N, F, M

5. RODENTICIDES						
The following rodenticides must be applied by trained personnel or a DoD certified pesticide applicator.						
00-089-4664 MSDS Label	Rodenticidal Bait, Anticoagulant, 0.005% Diphacinone	40 blocks	H	112.92	BX	A, N, F, M
01-577-2202 MSDS Label	Rodenticide, Anticoagulant, (Kaput Combo Bait Pellets), 0.020% Imidacloprid and 0.025% Warfarin	250 packets/bx	H	113.31	BX	A, N, F, M
01-598-2617 MSDS Label	Rodenticidal Bait, Anticoagulant, 0.005% Bromadiolone (Maki), pellets	175 pkgs/CO	H	153.37	CO	A, N, M. F
01-598-4840 MSDS Label	Rodenticidal Bait, Anticoagulant, 0.005% Brodifacoum (Talon-G), pellets	2 pails each w/150 pkgs per box	H	137.12	BX	A, N, M, F
01-501-2858 MSDS Label	Rodenticidal Bait, Anticoagulant, 0.005% Bromadiolone, (Contrac Blox), 1 oz bait blocks	18-lb co	H	91.92	CO	A, N, M, F
01-503-5348 MSDS Label	Rodenticidal Bait, Anticoagulant, 0.005% Brodifacoum, (Final Blox), 20 gram bait blocks	18-lb co	H	100.79	CO	A, M, N, F
00-753-4972 MSDS Label	Rodenticide, Anticoagulant, concentrate 0.106% sodium salt of diphacinone (LIQUA-TOXII)	50 pouches	H	88.57	BX	A, N, F, M
01-598-4844 MSDS Label	Rodenticide, Anticoagulant, concentrate 0.106% sodium salt of diphacinone (LIQUA-TOXII)	4 packages per box (8 packets per package)	H	98.78	PG	A, N, M, F
01-435-9318 MSDS Label	Rodenticide, 10% zinc phosphide (ZP Tracking Powder) ***RESTRICTED USE PESTICIDE***	(4) 500-g bot	H	47.48	BX	N, F
01-619-6419 MSDS Label	**Rodenticide, Anticoagulant, Difethialone 0.0025% (First Strike Soft Bait Rodenticide)**	**16 lb. co**	**Z**	**103.88**	**CO**	**A, N,M, F**

6. SURFACTANTS						
Surfactants are not pesticides, but are wetting agents that lower the surface tension, allowing easier spreading, and lower the interfacial tension between two liquids. Some pesticides, particularly herbicides, either require the use of a surfactant or performance may be improved by the addition of a surfactant. Refer to the pesticide label to determine if a surfactant is recommended by manufacturer.						
01-546-3053 MSDS Label	Surfactant, Pesticide, Spray Adjuvant (Cygnet Plus)	(2) 2.5-gal co	J	196.44	BX	A, N, M, F
01-356-8896 MSDS Label	Surfactant, Pesticide, Spray Adjuvant (Cide-Kick II)	(2) 2.5-gal co	H	256.91	BX	A, N, M, F
01-356-8897 MSDS Label	Surfactant, Pesticide, Spray Adjuvant (Cide-Kick)	(2) 2.5-gal co	H	238.15	BX	A, N, M, F

ARMED FORCES PEST MANAGEMENT BOARD (AFPMB) STANDARD PESTICIDES LIST AVAILABLE TO DOD COMPONENTS AND AGENCIES

October 1, 2013

NSN 6840-	Item (Alternative Trade Name)	Unit Package	AAC *	Price	Unit Issue	Users+

+User Code A=Army, N=Navy, F=Air Force, M=Marines SOS (DSCR-Richmond/DLA Aviation) =SMS

***ACQUISITION ADVICE CODES (AAC)**

D. DOD INTEGRATED MATERIAL MANAGER (IMM) STOCKED, AND ISSUED. Issue, transfer, or shipment is not subject to specialized controls other than those imposed by the Integrated Material Manager/Military Service supply policy.
   1. The item is centrally managed, stocked, and issued.
   2. Requisitions will be submitted in accordance with Military Service requisitioning procedures.

G. GENERAL SERVICES ADMINISTRATION (GSA) INTEGRATED MATERIAL MANAGED, STOCKED AND ISSUED. Identifies GSA managed items available from GSA Supply Distribution Facilities. Requisitions and fund citations will be submitted in accordance with GSA/Military Service requisitioning procedures.

H. CENTRAL CONTRACT - NOT STOCKED ITEM. Direct delivery under central contract # (non-stocked items) issue, transfer, or shipment is not subject to specialized controls other than those imposed by IMM/Service/Agency supply policy.
   1. The item is centrally managed and procured.
   2. Normal issue is by direct shipment from the vendor to the user at the order of the ICP or IMM. However, orders for quantities less than the vendor's minimum order of quantity may be issued from stock by ICP or IMM supply distribution facilities.
   3. Requisitions and fund citations will be submitted in accordance with IMM/Service/Agency requisitioning procedures.
   4. Generally, delivery will be made within applicable Service/Agency guidelines addressing customer-required time frame.

I. DIRECT ORDERING FROM A CENTRAL CONTRACT/SCHEDULE. Issue, transfer, or shipment is not subject to specialized controls other than those imposed by Integrated Material Manager/Military Service supply policy. The item is covered by a centrally issued contractual document, or by a multiple award Federal Supply schedule for GSA managed items, which permits using activities to place orders on vendors for direct delivery to the user.

J. NOT STOCKED, CONTROLLED PROCURED. Identifies IMM/Military Service centrally managed but not stocked items. Long lead times must be anticipated, since procurement will be initiated only after receipt of a requisition. Requisitions will be submitted in accordance with IMM/Military Service requisitioning procedures.

K. CENTRALLY STOCKED FOR OVERSEAS ONLY. Main means of supply is local purchase. Item is stocked in domestic supply system for those overseas activities unable to procure locally due to non-availability of procurement sources or where local purchase is prohibited. Requisitions will be submitted by overseas activities in accordance with Service/Agency requisitioning procedures. NOTE: CONUS activities will obtain supply support through local procurement procedures.

L. LOCAL PURCHASE. IMM/Military Service managed items authorized for local purchase, as a normal means of support, by the Military Service, or base, post, camp, or station level. Items not stocked in wholesale distribution system of IMM/Military Service ICP. The local purchase forms authorized by the individual IMM/Military Service must be used. NOTE: GSA FSS items are included.

V. TERMINAL ITEM. Identifies items in stock; but future procurement is not authorized. Requisitions may continue to be submitted until stocks are exhausted. Preferred items National Stock Number (NSN) normally provided by the application of the phrase, "When Exhausted Use (NSN)". Requisitions will be submitted in accordance with IMM/Military Service requisitioning procedures as applicable.

X. SEMIACTIVE ITEM-NO REPLACEMENT. A potentially inactive NSN which must be retained in the supply system as an item of supply because (1) stocks of the item are on hand or in use below the wholesale level and (2) the NSN is cited in equipment authorization documents TO&E, TA, TM, etc. or in-use assets are being reported.
   1. Items are authorized for central procurement but not authorized for stockage at wholesale level.
   2. Requisitions for in-use replacement will be authorized in accordance with individual Military Service directives.
   3. Requisitions may be submitted as requirements generate. Repetitive demands may dictate at ACC change to permit Wholesale stockage.

Y. TERMINAL ITEM. Further identifies AAC V items on which wholesale stocks have been exhausted. Future procurement not authorized.
   1. Requisitions will not be processed to the wholesale suppliers.
   2. Internal Services' requisitioning may be continued in accordance with Military Service requisitioning policies.

Z. INSURANCE/NUMERIC STOCKAGE OBJECTIVE ITEM. Items, which may be required occasionally or intermittently and prudence requires that a nominal quantity of material be stocked due to the essentiality or the lead-time of the item.
   1. The item is centrally managed, stocked and issued.
   2. Requisitions will be submitted in accordance with IMM/Military Service requisitioning procedures.

DLA/DSCR POC:

CLIFFORD MYERS

Appendix F
Statement of Work for Grounds Maintenance of the Cantonment and Munitions Area

PERFORMANCE WORK
STATEMENT FOR
GROUNDS MAINTENANCE SERVICES
CANTONMENT AND MUNITIONS AREA,
THE AIRFIELD/WETLANDS AREA

HOMESTEAD ARB, FL

13 May 2011

Prepared by 482

MSG/CE HOMESTEAD

ARB, FL

GROUNDS MAINTENANCE PWS
TABLE OF CONTENTS

1. DESCRIPTION OF SERVICES

The contractor shall provide non-personal services, to include all personnel, equipment, tools, supervision, and other items and services necessary to ensure that grounds maintenance is performed at Homestead Air Reserve Base (HARB). The contractor shall comply with applicable federal, regional, state, and local regulatory standards.

1.1. MAINTAIN IMPROVED GROUNDS

Improved grounds are identified in Appendix A and B.

1.1.1. Mow. The contractor shall maintain all improved grounds to look well manicured. Grass height shall be maintained between 2 and 4 inches and uniform in appearance. The contractor shall remove or mulch grass clippings when visible after mowing, before leaving work area. Ensure mulching activities occur in a designated area away from storm drainage structures.

1.1.2. Edge. The contractor shall edge sidewalks, driveways, street edges, curbs and other hard surface areas located within the improved grounds. Grass height shall match surrounding area grasses. Grass, vegetation and weeds shall be cut back no more than ½-inch from the surface edged, maintaining an even contour with the edged surface, uniform in appearance.

1.1.3. Trim. The contractor shall trim grass and weeds around trees, shrubs, buildings, fences, poles, fire hydrants, parking lots bumper blocks, boulders, culvert head walks, curbing and other fixed obstacles and temporary obstacles/objects not accessible to lawn mowers on improved grounds. Trimming height shall match surrounding area grass height. Ensure mulching activities occur in a designated area away from storm drainage structures.

1.1.3.1. Maintain vegetation 15’-0’ at each side of the perimeter fence.

1.1.4. Operation of irrigation systems. The contractor shall irrigate improved grounds to maintain the health of the turf ensuring no ponding of water, excessive runoff, etc. This includes lawns, plants, flowers, landscaped areas, and all areas requiring manual watering (see Appendix A and B). The Contractor is prohibited from connecting to any hydrant within the boundaries of the installation. Contractor shall practice water conservation measures whenever possible and shall position all watering systems to avoid overspray onto pavements, sidewalks, roadways, etc. Watering shall be performed during nighttime hours. If daytime watering is necessary, Contractor shall notify the CO or QAP of the reason for daytime watering, and the duration daytime watering will be in progress. Contractor shall be responsible for day-to-day operation of the base-wide automated irrigation system, to include minor repairs to restore the system to operation (ie, replace clogged sprinkler heads, repair leaky water piping, etc).

1.1.5. Remove Debris/Police Grounds. The contractor shall perform general litter patrol in all areas of improved grounds and additional areas identified in Appendix A and B. Police identified off base areas to maintain a neat and professional appearance.

1.1.5.1. Dead Animals. All dead animals are to be collected for disposal. Prior to disposing, report number and type to the QAP, who will forward report to Pest Management and Natural Resources. Contractor shall contact pest management and public health within 10 business days after contract award to get instructions on the protocols for handling dead animals (e.g., PPE and local disease protections).

1.1.5.2. Burrowing Owls. Homestead ARB is home to a population of Burrowing owls that are year-round residents. The owls are state-listed species of concern, and under various federal laws, DoD facilities are required to make good faith efforts to protect them from harm and harassment. During mating and breeding season (extends from FEB through JUL) their nesting sites should not be disturbed. The QAP, in conjunction with the Natural Resources Manager, will ensure that all known and or suspected nesting sites are clearly marked and or flagged for avoidance.

1.1.6. Leaf Removal. The contractor shall remove leaves in improved grounds to maintain a neat and professional appearance.

1.1.7. Fertilization. No fertilizer shall be used on HARB grass due to proximity to Biscayne NP and negative effects on its ecosystem.

1.1.8. Pest Control. The contractor shall provide all management, licenses, laboratory testing, tools, supplies, equipment, transportation and labor to develop and implement an Integrated Pest Management (IPM) plan in the areas covered by this Grounds Maintenance PWS in a manner that will ensure the health and general well being of installation personnel. The following types of pests, ants, roaches, mice, bees and wasps are common on this installation and their abatement should be specifically addressed the IPM plan and use to determine the workload. The Contractor shall use only approved pesticides as stated in DoD Instruction 4150.7, DoD Pest Management Program, Encl 4 para 4.2.2 and AFI 32-1053, Pest Management Program, para 4.7.4 and 4.7.6. All pesticides, herbicides, and rodenticides are defined in DoD and Air Force documents. The Contractor shall comply with current federal, state, local, DoD, and Air Force regulations, plans, and policies. The contractor shall comply with all applicable parts of 29 Code of Federal Regulations (CFR) 1910, Labor, Occupational Safety and Health Standards, 29 CFR 1925, Labor, Safety and Health Standards for Federal Service Contracts, 40 CFR 150-189, Protection of Environment, Pesticide Program, and 49 CFR 171, Transportation, General Information, Regulations, and Definitions. The Contractor shall ensure that all workers have current state certification for the pest control services being performed. Control weeds in improved grounds through execution of a weed control program appropriate for the area to maintain a professional appearance. Restore grounds made barren where weeds are removed to the level of care of the surrounding area (i.e. semi-improved, improved, etc.) Civil Engineer Asset Management Flight must

approve all herbicides prior to use. All herbicides and pesticides used must be on the installation-approved inventory list and applied by certified personnel. Herbicide application shall not impact surface waters in canals/ditches.

1.1.9. Lawn Renovation/Damage to Grounds. The contractor shall renovate lawns in improved grounds as identified by the QAP. This work will be issued via a separate work order by the BCE or his designated representative. Renovate deteriorated lawn area to match surrounding areas. Areas damaged by the contractor will be repaired by the contractor at no cost to the Government.

1.1.10. Prune Shrubs, Hedges and Other Plants. The contractor shall prune/trim shrubs and other plants to maintain their natural growth characteristics to enhance the beauty and health of the plant. Hedges shall be maintained to their natural mature height and shape. Shrubs, plants, hedges, and ground cover/vines shall be pruned/trimmed 3 inches away from buildings, fences, curbing, sidewalks, and other fixed obstacles. All ground cover and plants shall be kept within the bed borders. All plants and landscape around ground lights shall be pruned/trimmed to allow light usage for its intended purpose. Shrubs and hedges located on street corners, curb easements, etc. shall be pruned/trimmed to keep from obstructing view of oncoming traffic. Areas beneath shrubs and hedges shall be kept free (clean) of all grass, weeds, vegetation, and debris. Volunteer tree growth seedlings shall be removed at no additional cost to the government.

1.2. MAINTAIN SEMI-IMPROVED GROUNDS.
Semi-improved grounds are identified in Appendix A and B.

1.2.1. Mow. The contractor shall maintain grass height between 4 and 10 inches in all semi-improved grounds areas except in airfield areas designated as Bird Aircraft Strike Hazard (BASH) areas. Maintain grass height between 7 and 14 inches in BASH areas. Cutting of grass on airfield grounds shall be accomplished only after Airfield Management has approved scheduled times.

1.2.2. Trim. The contractor shall trim grass and weeds around trees, shrubs, buildings, fences, poles, fire hydrants, parking lots bumper blocks, boulders, and other fixed obstacles and temporary obstacles/objects on Semi-improved grounds. Trimming height shall match surrounding area grass height. All areas shall be trimmed concurrent with mowing. Grass clippings shall be removed or mulched when visible after trimming, before leaving work area.

1.2.3. Airfield Coordination. The contractor shall coordinate all activities on the airfield by contacting Airfield Management. Work will be accomplished only after Airfield Management has approved scheduled times.

1.2.3.1. Flight-line Drivers. Training must be completed prior to operating vehicles or mowers on the flight line. All employees working on airfield grounds shall be required to have an AF Form 483, Certificate of Competency (flight line driver's license) with them at all times. Vehicles must have a valid POV pass issued by Airfield Management prior

to operating on the flight line. No equipment will be left unattended while working in these areas.

1.2.3.2. Airfield Tower Communications. The contractor shall be radio-equipped to maintain constant two-way radio contact with the control tower and Airfield Management when operating near runways, overruns, and taxiways. The contractor shall maintain contact with the control tower when operating on or within 150 feet of the runway. The contractor shall provide all communication equipment required for this contract. The government shall provide the transceiver frequency to the contractor. All equipment shall be VHF type with a minimum five-mile range and shall have private line capability. The contractor will be responsible for any changes to radio types or frequency changes that the base makes in the course of this contract. The contractor shall respond immediately to the directions of the Air Traffic Control tower personnel.

1.2.3.3. Airfield Light Fixtures. The contractor shall cut a 10 foot wide path between 4" and 6" in height around the perimeter of the airfield pavement to include trimming around runway and taxiway lights and other fixed obstacles and temporary obstacles/objects in accordance with improved grounds standards. Grass, vegetation and weeds shall not extend over the edge of concrete, pads, taxiways, runways, and paved or asphalt areas.

1.2.3.4. Airfield Work Area. The contractor shall be responsible for ensuring that all foreign objects and debris produced by grounds maintenance is cleared off of all taxiways, runways, and aircraft parking aprons before leaving the work area.

1.2.3.5. Contractor shall cut grass around the runway lights and distance markers to the height of 1 ½ inches with a 6 foot circle around each, so the lights can be seen at all times.

1.2.3.6. Cutting of grass in restricted areas shall require clearance or escort by appropriate authority. The QAP shall notify the contractor of requirements/schedules.

1.3. MAINTAIN UN-IMPROVED GROUNDS. Un-improved grounds are identified in Appendix A and B. The contractor shall maintain grass and vegetation in un-improved grounds to prevent woody encroachment. The contractor shall mow un-improved grounds to maintain a height not to exceed 14" (except BASH areas). This will minimize the growth of Burma reed and other non-native plants that would present potential fire hazard problems for the base. Wetlands area consists of 208 acres of unimproved grounds as indicated in Appendix A and B. This includes lowlands saturated with water that are not built up or developed. The wetlands will be maintained between 7 and 14 inches high IAW AFI 91-202, titled The U.S. Air Force Mishap Prevention Program. The wetlands area may be accomplished by using weed eaters, chainsaws, or other equipment that can be operated by a worker walking through the areas or working off a boat or airboat. Vehicles that will cause sunken tracks or grooves on wetlands soil will not be allowed for the removal of vegetation. Care shall be taken to keep all cut vegetation, soil and sediment out of canals. No soil disturbance is allowed in the wetland

areas. Regions within the lowland areas varies from marshy to almost dry grounds with vegetation growth that includes cattail grass, cane grass, tree stumps, sprigs of previously cut trees like Brazilian Pepper, Ficus, Australian Pines, Willow and other trees.

1.4. MAINTAIN VEGETATIVE BEDS, INERT BEDS AND RELATED AREAS The contractor shall maintain vegetative beds, inert beds, and related areas as identified in Appendix B. Maintenance activities may include but are not limited to fertilizing, watering, weeding, mulching, and repairing or replacing of damaged plants and shrubs. When replacing plants, shrubs, and performing repairs, conform to good Xeriscaping practices for the area.

1.4.1. Use only high quality cypress mulch.

1.5. MAINTAIN SURFACE DRAINAGE DITCHES AND CANALS. The contractor shall maintain surface drainage ditches and canals to be free of shrubs, trees, silt and trash to prevent erosion and ensure continuous flow of water. Drainage ditches and canals to be maintained are identified in Appendix A and B.

1.5.1 Drainage canals (which consist of approximately 80,000 LF) and ditches shall be maintained at the same height of surrounding vegetation. Cut must be consistent with the drainage scheme and free flow of water.

1.5.2. Care shall be taken to keep all cut vegetation, soil and sediment out of canals. No soil disturbance is allowed in the wetlands areas.

1.5.3. Areas where vegetation (cattails) is growing in canals will be cut at water level. Those that are growing in front of culverts will be removed with it's root system. Care shall be taken to minimize disturbing sediment while removing vegetation from canals. No dredging of canals is authorized.

1.5.4. Canals containing water shall be cut four (4) to six (6) inches above the water line. Canals that are dry (no water) shall be cut at a height of no higher than three (3) inches.

1.6. SECTION RESERVED

1.7. SPECIAL REQUIREMENTS

1.7.1. Trees. The contractor shall prune or trim all trees as necessary or as directed. The contractor shall be responsible for identifying all trees that require pruning or trimming. Pruning or trimming shall be accomplished in accordance with the American National Standards Institute ANSI A300 Part 1 industry standards. Over-pruning of trees is a violation of Chapter 24 of the Miami-Dade County Code. Because the base is located within a hurricane prone area, the QAP should ensure that the contractor follows the county's tips (NOTE: can be found on the county website) for proper pruning of trees. Pruning shall be required to lift, remove, and/or cutback branches that conflict with normal traffic or safety. In addition, the contractor shall prune or trim trees that pose public safety hazards. Minimum safety clearances are: 14 feet over streets, 12 feet over

driveways, 8 feet over walk areas, 4 feet over buildings, and 1 foot from buildings. Trees that pose threats to structures or buildings shall be removed. Topping is not permitted. Trimming or pruning of trees that touch or hang over energized utility poles or power lines is the responsibility of the contractor. Minimum clearance from primary lines (over 600 volts) shall be 8 feet. Minimum clearance from secondary lines (under 600 volts, i.e. electric service drops, telephone, and cable TV) shall be 4 feet. Contractor shall be responsible for removing all debris generated from trimming or pruning operations. This service is issued as a work order and must be completed within five (5) workdays from notification.

1.7.1.1. Tree Care. The contractor shall brace, cable, guy (to keep tree vertical), and deep water all damaged trees after identification. The contractor shall remove all guy wires, cables, straps, and stakes when the trees remain vertical (normally, after one growing season). The contractor shall adjust wires, cables, and straps as required, to prevent girdling.

1.7.1.2. Tree Standards. The contractor shall perform all tree work in accordance with contract specifications and the following tree care standards, latest addition, unless otherwise directed by the CO.

ANSI A300 - Standard Practices for Tree Care Operations including referenced Combined Federal Regulations (Utility Pruning and Emergency Service Restoration)

ANSI A300 (Part 1) – Tree Pruning

ANSI A300 (Part 3) – Tree Support Systems (Cabling, Bracing, and Guying)

ANSI Z60.1 – American Standards for Nursery Stock

ANSI Z133.1 – Safety Requirements for Tree Care Operations

1.7.1.3. Emergency Spot Pruning/Trimming. Emergency spot pruning/trimming shall only be accomplished through issuance of a work order by the BCE or his designated representative. The contractor shall complete an emergency spot pruning/trimming within one (1) workday from the work order date. Typically, emergency spot pruning/trimming includes removal of dead and/or broken limbs or removal of limbs for required clearances.

1.7.1.4. Tree and Stump Removal. Tree and stump removal shall only be accomplished through issuance of a work order by the BCE or his designated representative. The contractor shall perform stump and perimeter roots removal by completely removing, by cutting and grinding all growth to a minimum of 8 inches below grade, or until bedrock has been reached. After the grinding down of Australian pine and Brazilian pepper stumps, the application of herbicides would be required to prevent lateral re-growth. Stumps shall be ground within one (1) workday of the tree removal date. Stump-grinding debris shall be removed the same day grinding is performed. In

areas where a lawn sprinkler system exists, the contractor shall backfill with topsoil, and lay sod to match the existing ground grade. In areas where no lawn sprinkler system exists, the contractor shall backfill with topsoil and compact to match existing grades and lay sod as directed. Trees identified for removal shall be considered within the following categories, Large, Medium, Small and Sapling, as based on their diameter. The diameter of the tree shall be determined by measuring Diameter Breast Height (dbh). Trees with multiple trunks shall be measured as follows: All trunk diameters shall be measured. The largest trunk diameter shall be recorded. Each remaining trunk diameter shall be halved. All values will then be added together to obtain the final tree diameter.

Large Trees: Diameter 36" and above, remove within 10 workdays from the work order date.

Medium Trees: Diameter 24" to less than 36", remove within 10 workdays from the work order date.

Small Trees: Diameter 3" to less than 24", remove within 5 work days from the work order date.

Saplings: Diameter 3" and smaller, remove within 2 workdays from the work order date.

1.7.1.5. Emergency Tree and Stump Removal. The contractor shall perform emergency tree and stump removal only after the issuance of a work order by the BCE or his designated representative.

Large Trees: Remove within 2 workdays from the work order date

Medium Trees: Remove within 2 workdays from the work order date

Small Trees: Remove within 1 working day from the work order date

Saplings: Not required

1.7.1.6. Clearing, Grubbing, Leveling Areas. The contractor shall clear, grub (remove vegetation, tree roots, etc, to a level below the surface that would not allow the regrowth of that item to the surface) and level areas identified by the QAP to enable mowing of the land surface to control growth. Such work includes removal of trees, rocks (that would impede mowing of the area), exposed roots, filling holes with clean fill, and similar activities to restore the area to level terrain in order to permit mowing of the remaining vegetation in the area (ie, grass). Acceptable disposal methods for the debris includes mulching and spreading onsite or removal from Homestead ARB. Pricing for this effort should be inclusive of all actions taken to accomplish. It is not the intent that the effort for this paragraph will be combined with any other CLINs that allow for debris removal, shrub pruning, or tree and stump removal.

1.7.2. Emergency and Special Event Services. The contractor shall upon notification by the contracting officer through the issuance of an oral or written work order by the

BCE, perform emergency or special event grounds maintenance service. Upon notification of an emergency, the contract manager shall respond within one (1) hour to meet with the contracting officer and government evaluator and initiate emergency services. Upon receiving direction by the contracting officer, contractor personnel shall begin emergency work within two hours. Oral work orders for emergency services to minimize damages or mitigate hazardous conditions will be confirmed with written work orders. The contracting officer will notify the contractor as soon as a special event requirement is known, but no less than 24 hours prior to the event.

1.7.3. RESERVED

1.7.4. Special Cuts. The contractor shall upon notification by the contracting officer through the issuance of a work order by the BCE, perform special cuts. Provide unit pricing for Special Cuts as shown in Exhibit A of the Bid Schedule.

1.7.5. Planting trees, shrubs, and vegetative beds. The contractor shall upon notification by the contracting officer through the issuance of a work order by the BCE or his designated representative, perform planting of trees, shrubs, and vegetative beds to include but not limited to: removal and disposal of trees, shrubs, or vegetative beds being replaced; soil preparation and amendments; performance of maintenance after planting to include watering, pruning; and insect and disease prevention to promote survivability. Only low maintenance, Minusculas indigenous shrubs/trees shall be acceptable candidates for planting as directed. Provide unit pricing for planting trees, shrubs, and vegetative beds as shown in Exhibit A of the Bid Schedule.

1.7.5.1. All debris caused by the job shall be removed and disposed of off the base by and at the expense of the contractor and in accordance with Miami-Dade County ordinances. The nearest county dump is located within an eight (8) mile radius of the base. The job site shall be cleaned at the completion of each workday.

1.7.5.2. The Contractor shall provide the Contracting Officer a copy of the disposal tickets or coupons for all debris removed from the base.

2. SERVICES SUMMARY

The contract service requirements are summarized in performance objectives that relate directly to mission essential items. The performance threshold briefly describes the minimally acceptable levels of service required for each requirement. The Services Summary (SS) and the contractor's Quality Control Plan provide information on contract requirements, the expected level of contractor performance and the expected method of government surveillance and confirmation of services provided. These thresholds are critical to mission success. Procedures as set forth in the FAR 52.212-4 (a), Contract Terms and Conditions - Commercial Items, Inspection/Acceptance, will be used to remedy all deficiencies. During the first initial 30 days of the contract, two additional errors on each task shall be allowed in an effort to identify normal phase-in problems.

Performance Objective	PWS Para	Performance Threshold
SS-1 Maintain Improved Grounds	1.1, inclusive	No more than 5 valid defects per month
SS-2 Maintain Semi-Improved Grounds	1.2, inclusive	No more than 5 valid defects per month
SS-3 Maintain Un-Improved Grounds	1.3.	No more than 3 valid defects per month
SS-4 Maintain Vegetative Beds, Inert Beds and Related Areas	1.4.	No more than 3 valid defects per month
SS-5 Remove Debris/Police Grounds	1.1.5 Thru 1.1.6	No more than 3 valid defects per month
SS-6 Special Requirements	1.7, inclusive	No more than 3 valid defects per month

SS-7 Quality Control Contractor's Quality Control Plan (Incorporated into contract after award)	2.1	No more than 3 valid defects per month

2.1. QUALITY CONTROL. The contractor shall provide a written description of the quality control system to include identification of the commercial practices and procedures to be used, such as those of the Professional Grounds Management Society (PGMS), Tree Care Industry Association, American Society of Landscape Architects, the American National Standards Institute (ANSI), and local Extension Offices of the Federal Cooperative Extension Service. Include the inspection system requirements of FAR 52.246-4 in this document. The contractor shall develop and implement procedures to identify, prevent, and ensure non-performance and continual repeat of defective service does not occur. A written Quality Control Plan shall be submitted to the contracting officer for review, feedback and approval. The plan shall be submitted no later than the pre-performance conference. The plan shall specifically address the contractor's strategy to provide quality workmanship, continual process improvement and for correcting deficiencies as required.

3. GOVERNMENT FURNISHED PROPERTY AND SERVICES.

3.1. FACILITIES The Government will provide the facilities identified below for contractor use in support of the requirements of this contract. The facilities are provided "as is." Obtain Contracting Officer approval in advance of making any changes to the facilities. Such changes will be at no cost to the Government unless otherwise approved by the Contracting Officer. The contractor shall ensure facilities are maintained in a neat, clean and professional manner. The Government reserves the right to reallocate and relocate assigned facilities during the term of the Contract. Upon completion or termination of this Contract, or upon such reallocations or relocations, return facilities to the Government in the same condition as received, fair wear and tear and approved modifications.

3.1.1. Approximately 1500 square feet of indoor floor space and 1000 square feet of exterior space is provided at Bldg 813.

3.2. UTILITIES

The Government will not furnish electricity, water, and sewage as necessary for accomplishment of work in accordance with this contract. All facilities do not receive the same utility services. The Contractor shall not change or modify any utility system or component; or connect any Contractor property, equipment or system without prior

Contracting Officer review and approval. The contractor shall practice energy conservation in the Government provided facilities.

3.3. MATERIALS

None

3.4. SECURITY, FIRE, AND MEDICAL SERVICES

The Government will provide police and fire protection. In the event of a medical emergency, base ambulance service for transporting an injured employee to a local hospital is available on a cost reimbursement basis.

3.5. TELEPHONE

The Government will not provide any telephone line(s) in the Government provided facility for contractor use.

3.6. SOLID WASTE COLLECTION AND DISPOSAL.

The Contractor shall use existing dumpsters to dispose of trash policed up during the accomplishment of services detailed in this PWS. The contractor shall not dispose of solid waste in base dumpsters outside the scope of this contract. The contractor will not dispose of vegetation clippings in the base dumpsters. The contractor shall adhere to all base recycling programs. The Contractor shall provide the Contracting Officer a copy of the disposal tickets or coupons for all debris removed from the base.

4. GENERAL INFORMATION

4.1. RESERVED

4.2. RESERVED

4.3. RESERVED

4.4. ENVIRONMENTAL REQUIREMENTS.

In addition to all applicable Federal, State and local environmental codes and regulations, the following specific guidance is provided:

4.4.1. Hazardous Materials. Through the Contracting Officer, the BCE shall approve all hazardous materials brought on-site by the contractor prior to use. The contractor shall obtain approval using the application requirements of the AF Form 3952. Once the process is implemented and contractor is trained, the contractor may submit the AF Form 3952, with the appropriate Material Safety Data Sheets (MSDS) electronically. The BCE has the right to prohibit the use of hazardous materials it deems to be especially hazardous to human health and environment. In the event the BCE does not approve a hazardous material for use, the BCE may provide the contractor a list of suitable substitutes; however, the contractor shall retain responsibility for finding an acceptable

substitute. The contractor shall take appropriate actions to comply with waste minimization and pollution prevention practices and policies.

4.4.1.1. The contractor shall maintain spill control material on hand at all times sufficient to contain a worse case spill, both volume and hazard level.

4.4.2. Pesticides. All pesticides must be approved prior to use by the Command Entomologist if not on base approved list (Submit list with intended uses via the CO). The contractor shall provide an inventory of hazardous materials with the applicable Material Safety Data Sheet (MSDS) that will be used to perform the required services. In addition, use reasonable care to avoid releasing hazardous material or hazardous waste, which may cause environmental damage to government structures, public land, water, or other natural resources. If the Contractor's failure to use reasonable care causes damage to any of this property, the Contractor shall replace or repair the damage at no expense to the Government as the Contracting Officer directs. If the Contractor fails or refuses to make such repair or replacement, the Contractor shall be liable for the cost, which may be deducted from the contract price.

4.4.2.1. Pesticide Storage and Mixing. Perform pesticide storage and mixing operations off base. No cleaning of pesticide/herbicide application equipment is to be done on base.

4.4.2.2. Monthly reports. The Contractor shall submit a report to the Contracting Officer within 10 working days following each month listing all pesticide applications made. Include pesticide name, use concentration, amount applied, date, and detailed location of use. A DD Fm 1532 will be provided on request to facilitate record keeping.

4.4.2.3. The Contractor is subject to inspection by DOD certified applicators/inspectors as well as State Department of Agriculture Pesticides Division or equivalent agency.

4.4.3. Hazardous Materials Inventory. The contractor shall maintain an up-to-date hazardous material inventory with copies of MSDS(s) for all materials used on the job site. The contractor shall maintain a complete copy of all approved MSDS and AF Form 3952s.

4.4.4. Hazardous Materials Management: The contractor shall remove all hazardous materials by the end of each workday. Contractor shall not conduct process treatments (e.g. paint thinner solvent recycling) on base.

4.4.5. Final Report. The contractor shall submit a final inventory, not later than ten working days following termination/completion of this contract, of all hazardous materials used since the last hazardous usage report to the QAP. The final inventory will list all hazardous materials used, total amount of each used, and a description of the disposition of any remaining hazardous material.

4.4.6. ENVIRONMENTALLY RESTRICTED AREAS. OU-12 (area west of Bldg 360) and OU-15 (Bldg 153) restricted areas are identified in the aerial photographs contained in Appendix B. These areas will be permanently flagged for contractor's reference during performance of contract. Mowing frequency in these areas shall not be greater than once every four (4) weeks or as indicated by the Contracting Officer and QAE.

4.4.7. OU-18 (FORMER LANDFILL) AREA. The Contractor shall, when requested by the Contracting Officer or authorized representative, provide ground maintenance services to the semi-improved grounds located in area OU-18. The area of interest is identified in the map contained in Appendix B. Contractor shall mow and maintain this area in accordance with all specifications contained in this SOW.

4.5. PERMITS, LICENSES AND CERTIFICATIONS

Unless otherwise specified in this contract, obtain necessary permits, licenses, and certifications; give all required notices; and comply with applicable Federal, State, County, and local laws, codes, and regulations in performance of the requirements of this contract. Maintain records of such requirements and make the documentation available to the Government for review. All pesticide application will be made by State or Host Nation certified applicator as prescribed in DoDI 4150.7.

4.6. HOURS OF OPERATION.

The services in this PWS shall be performed during normal duty hours which are 0700 to 1700, Mondays through Fridays, excluding federal holidays, unless otherwise required in the contract or approved by the Contracting Officer. Do not perform services in residential areas, housing and dormitories, before 0730. There may be situations that require the contractor to work at times other than normal working hours. When the contractor's work schedule conflicts with an Air Force mission requirement, the BCE will advise the Contracting Officer and reschedule the work to minimize disruption.

4.7. RECOGNIZED HOLIDAYS. The contractor is not required to provide service on federal holidays, except in emergency situations; the holidays are:

New Year's Day - 1 January
Martin Luther King Day - 3rd Monday in January
Washington's Birthday - 3rd Monday in February
Memorial Day - last Monday in May
Independence Day - 4 July
Labor Day - 1st Monday in September
Columbus Day - 2nd Monday in October
Veteran's Day - 11 November
Thanksgiving Day - 4th Thursday in November
Christmas Day - 25 December

If these holidays fall on Saturday, the preceding Friday will be observed. If these holidays fall on Sunday, the following Monday will be observed. If a holiday falls on a scheduled service day, the Contractor will be responsible for rescheduling services for the first day post the holiday observance.

4.7.1. Base Closures. Work scheduled but not accomplished because of base closure due to weather, exercises, or actual alert, will be accomplished as soon as possible after reopening the base.

4.8. SECURITY REQUIREMENTS.

Comply with Homestead Air Reserve Base security regulations. These regulations are available for review in the Contracting Office and the requirements of Clause 5352.242-9000. Security and base access requirements are contained in clause 5352.242-9000 "Contractor Access to Air Force Installations." Contractor employees will be required to obtain and display identification badges. Anticipate delays in getting commercial vehicles on base and allow time for commercial vehicles to reach their destination by driving designated routes at posted speed limits throughout the base. Procedures for commercial vehicle access to the base are subject to change without prior notice.

4.9. PERFORMANCE OF SERVICE DURING CRISIS OR HEIGHTENED SECURITY.

In accordance with DoDI 3020.37, Continuation of Essential Contract Services During Crisis, and the Air Force implementation thereof, unless otherwise directed by an authorized Government representative, it is determined that the following Grounds Maintenance Service requirements are essential to be performed during a crisis: maintenance of improved, semi-improved and unimproved grounds to include removal of trees and other vegetation subsequent to a major tropical storm or hurricane. All other services included in the contract are non-essential. The contract price and delivery schedule may be adjusted to reflect any change of work that may be directed.

4.9.1. Contractor shall identify employees having military mobilization recall commitments and shall develop a Contingency Plan for submission to the Government that provides its plan for providing essential contract services during a crisis.

4.10. SPECIAL QUALIFICATIONS.

The contractor shall provide the name and telephone number of the Contractor's on-site contract manager and alternate. Provide telephone numbers of contractor manager and alternate(s) for after duty hours. The contract manager and alternate(s) must be able to read, write, speak and understand English, or an interpreter may be provided to work alongside the contract manager or alternate(s) at no additional cost to the Government.

4.11. INTERFACES

Do not unduly interfere with regularly scheduled Government operational activities in the performance of contract requirements. In the event a Government supervisor so requests, temporarily cease work in the area and report the instructions, to include name of the Government person involved, to the Contracting Officer immediately by the most expedient means. Notify the Contracting Officer verbally of disputes with customers or other base contractors and follow-up in writing.

4.12. RESERVED

4.13. WORK CLEARANCE REQUESTS

The contractor shall obtain an approved Work Clearance Request for all work which involves excavation including minor digging. Digging permits are available from Base Civil Engineering Department.

4.14. SAFETY REQUIREMENTS AND REPORTS

The contractor shall perform work in a safe manner as required by OSHA Safety and Health Requirements. Provide a verbal report to the Contracting Officer as soon as possible of each occurrence of damage to Government property or an accident resulting in death, injury, occupational disease, or adverse environmental impact. Provide a completed copy of required Accident Investigation Reports to the Contracting Officer within five calendar days of each occurrence.

4.15. RESERVED

4.16. PARTNERING AGREEMENT

The Contracting Officer may require a partnering agreement between the Government and Contractor to facilitate joint cooperation and a sound partnership of all parties involved in the execution of this contract. Partnering is the creation of a Government-Contractor relationship that promotes achievement of mutually beneficial goals. It involves an agreement in principal to share the risk involved in completing the project and to establish and promote a nurturing partnership environment. Representatives from each organization are encouraged to participate in developing a partnering agreement. The partnering agreement that results may be formal or informal. If formal, it should be reduced to writing and signed by the parties involved.

4.16.1. The contractor shall not employ any person who is an employee of the United States Government if employing that person would create a conflict of interest or the appearance of a conflict of interest. Additionally, the contractor shall not employ any person who is an employee of the Department of the Air Force, either military or civilian, unless such person seeks and receives approval according to DoDR 5500.7, *Joint Ethics Regulations (JER).* The contractor shall not employ any person who is an employee of the Department of the Air Force if such employment would be contrary to the policies in AFI 64-106, *Air Force Industrial Labor Relations Activities*.

APPENDIX A – GROUNDS DESCRIPTION/ANNUAL WORKLOAD ESTIMATES

ITEM	DESCRIPTION	ESTIMATED QUANTITIES	
		Quantity	Unit
1	Improved Grounds	448	Acres
2	Edging	40,000	Linear Feet
3	Trimming	10,000	Square Feet
4	Areas without Irrigation Systems (requires manual watering techniques)	¼	Acres
5	Irrigation	2	Acres
6	Debris Removal and Policing	2	Acres
7	Leaf Removal	2	Acres
8	Fertilizer and/or Lime	N/A	Acres
9	Pest Control	2	Acres
10	Renovate Lawns	1	Acres
11	Prune Shrubs and Other Plants	600	Each
12	Semi-improved Grounds (excluding BASH areas)	537	Acres
13	Semi-improved Grounds BASH area	350	Acres
14	Mow Un-Improved Grounds	208	Acres
15	Flower and Rock Beds and Related Areas	8,000	Square Feet
16	Surface Drainage Ditches	4,000	Linear Feet
17	Snow/Ice Removal	N/A	
18	Tree Pruning	121	Each
19	Special Cuts	2	Acres
20	Plant Trees, Shrubs, Vegetative Beds	622	Each
21	Maintain vegetation 15’-0’ at each side of the perimeter fence.	49	ACRES
22	Maintain vegetation 15’-0’ wide at each side of the canals.	70	ACRES
23	Clearing, Grubbing, Leveling Areas	10	ACRES

NOTE: DIMENSIONS AND QUANTITIES SHALL BE VERIFIED BY THE CONTRACTOR.

Appendix A

APPENDIX B – AREA MAPS OR SITE PLANS

Improved, Semi-improved and Un-Improved Grounds (with BASH areas)
and 7 sheets Wetland Areas.

Edging & Trimming 1 sheet – Cantonment Area Only.

Areas Requiring Irrigation and Areas with Irrigation Systems (N/A Sheets) – Cantonment Area Only.

Areas Requiring Debris Removal and Policing Base Wide

Areas Requiring Leaf Removal 1 Sheet – Cantonment Area Only.

Areas Requiring Fertilizer and Liming (N/A Sheets)

Flower Beds, Rock Beds, and Related Areas (N/A Sheets) – Cantonment Area Only.

Surface Drainage Ditches (N/A Sheets) – Cantonment Area Only.

1. Base Layout Plan
2. Ground Maintenance Cantonment Area
3. Cantonment Area Map
4. Base Wetlands Plan (See Appendix B)
5. Asphalt and concrete pavement (Area #1) Base Layout Plan

APPENDIX C – DATA REQUIREMENTS

Provide the data as indicated below to the Contracting Officer. All reports, submittals, logs, and information provided to the Government shall be electronic and compatible with Microsoft Office, such as Excel, Word, and others. "Compatible" means the document can be opened using the appropriate Microsoft Office component without any discernible effect on the text (e.g., loss of data) or the formatting of the document:

Item No.	Description	Format	Frequency
1.	Quality Control Plan	Contractor Format	30 days after contract award
2.	Yearly Schedule of Work to be Performed	Mutually agreed upon format	Pre-performance conference and as changes occur
3.	Work Performed for the month	Mutually agreed upon format	Monthly (by the 10th of the following month)
4.	Hazardous Materials Usage Report	Mutually agreed upon format	NLT 10 days after completion/termination of contract
5.	Crisis Management Plan	Mutually agreed upon format	10 days after contract award and as changes occur.

APPENDIX D – DEFINITIONS

1. Scalping – areas where the grass is mowed too close to the ground because of uneven ground underneath. When grass is mowed too close to the ground it frequently appears as an unsightly yellow scar. Typically scalping occurs when mowing on hill sides and around obstacles on uneven terrain.

2. Xeriscaping - a landscaping method that employs drought-resistant plants in an effort to conserve resources, especially water, and reduce yard trimmings. Xeriscaping uses decorative brick, lava rock, mulch and low water vegetation such as bougainvillea, hibiscus, cactus, and evergreen ground covering plants to eliminate the high costs of maintaining 2”-4” grass fields and reduce the cost of watering.

3. Rutting – visible marks left on the grounds from the wheels of mowing and edging equipment.

4. Topping – The reduction of a tree’s size using heading cuts that shorten limbs or branches back to a predetermined crown limit. Topping is not an acceptable pruning practice.

5. Diameter Breast Height (dbh) – The diameter of a tree measured at a point 4.5 feet above the ground line.

6. Trimming – Cutting of grass and other vegetation around grounds obstacles that prevent mowing.

7. Special Cut - Grass cutting in high profile areas of the base such as ceremonial areas, ornamental areas, distinguished visitor routes, quarters, and entrances. A DV cut is generally performed more frequently than other cuttings and the height range specified is usually smaller. Grass clippings are removed from the area and the end result is uniform in appearance, well manicured, and complete.

8. Grubbing - Remove vegetation, tree roots, etc, to a level below the surface that would not allow the regrowth of that item to the surface.

APPENDIX E - IRRIGATION SYSTEM OPERATION

THE CONTRACTOR MUST OPERATE THE IRRIGATION SYSTEMS.

Only five (5) areas.

Area No. 1 at south side of Perimeter Fence at south side of Bougainville Blvd between the two entrance gates. See DWG #3

Area No. 2 at west side across the parking area of Bldgs 401, 404 & 471, between the exist running track and east chain link perimeter fence. See DWG #3.

Area No. 3 at Visitor Quarters, Bldg 410 around the building perimeter and the adjacent parking lot.

Area No. 4, at base entrance gate areas at Westover and Coral Sea and adjacent areas.

Area No. 5, at Base Operations, Bldg 702 entrance area.

APPENDIX F – LIST OF NATIVE PLANTS

This appendix identifies native plants that can be used for native landscaping at Homestead ARB, including perennials, annuals, shrubs, and trees. The lists of plants contain both the botanical and common names.

Perennials for Native Landscaping

Botanical Name	Common Name
Aster caroliniens	Climbing aster
Aster walteri	Walter's aster
Borrichia frutescens	Sea oxeye daisy
Carphephorus corymbosus	Florida Paintbrush
Cirsium spp.	Thistle
Coreopsis spp.	Tick-seed
Echinacea purpurea	Purple coneflower
Eupatorium coelestinum	Mistflower
Helianthus angustifolius	Narrow-leaved sunflower
Liatris spp	Blazing star
Pityopsis graminifolia	Silkgrass
Rudbeckia hirta	Black-eyed Susan
Solidago fistulosa	Goldenrod
Asclepias curassavica	Scarlet milkweed
Asclepias incarnata	Swamp milkweed
Asclepias longiflora	Florida milkweed
Asclepias pedicellata	Pedicellate milkweed
Asclepias perennis	White milkweed
Asclepias tuberosa	Butterfly weed
Ipomoea alba	Moonflowers
Ipomoea cordatotriloba	Morning glory
Ipomoea imperati	Beach morning glory
Ipomoea indica	Morning glory
Ipomoea sagittata	Glades morning glory
Piloblephis rigida	Pennyroyal
Salvia coccinea	Tropical sage
Salvia lyrata	Lyre-leaf sage
Salvia riparia	Southern sage
Passiflora incarnata	Maypop
Passiflora lutea	Yellow maypop
Passiflora multiflora	Passion vine
Passiflora suberosa	Corky-stemmed passion-flower
Cyperus planifolius	Coastal sedge
Dichromena colorata	Fine leaved whitetop sedge
Dichromena latifolia	Giant whitetop sedge
Avicennia germinans	Black mangrove
Callicarpa americana	Beautyberry
Duranta repens	Golden dewdrop
Lantana depressa	Pineland lantana
Lantana involucrata	White lantana
Phyla nodiflora	Matchhead
Stachytarpheta jamaicensis	Blue porterweed
Verbena bonariensis	Purple top
Verbena tampensis	Tampa vervain

Perennials for Native Landscaping

Botanical Name	Common Name
Dyschoriste oblongifolia	Twinflower
Justicia ovata	Water willow
Ruellia caroliniensis	Wild petunia
Ruellia malacosperma	(no common name)

Annuals for Native Landscaping

Botanical Name	Common Name
Bidens pilosa	*Spanish needles*
Helianthus debilis	*Beach sunflower*

Grasses, Sedges, Rushes, and Reeds for Native Landscaping

Botanical Name	Common Name
Muhlenbergia capillaris	*Muhly grass*
Spartina bakeri	*Sand cordgrass*
Tripsacum dactyloides	*Fakahatchee grass*

Shrubs for Native Landscaping

Botanical Name	Common Name
Scaevola plumieri	*Inkberry*
Callicarpa americana	*Beautyberry*
Duranta repens	*Golden dewdrop*
Lantana depressa	*Pineland lantana*
Lantana involucrata	*White lantana*
Phyla nodiflora	*Matchhead*
Stachytarpheta jamaicensis	*Blue porterweed*
Verbena bonariensis	*Purple top*
Verbena tampensis	*Tampa vervain*
Chrysobalanus icaco	*Cocoplum*
Aeschynomene viscidula	*Shy leaf*
Amorpha fruticosa	*Leadplant*
Caesalpinia crista	*Gray nicker*
Cassia chamaecrista	*Partridge pea*
Cassia chapmanii	*Bahama cassia*
Cassia nictitans	*Sensitive plant*
Cassia occidentalis	*Coffee senna*
Crotalaria pallida	*Rattlebox*
Dalea carnea	*Dalea*
Dalea pinnata	*Summer farewell*
Dalea pinnata var. adenopoda	*White prairie clover*
Erythrina herbacea	*Coral bean*
Galactia floridana	*Florida milk pea*
Galactia elliottii	*White milk pea*
Lupinus diffusus	*Sky-blue lupine*
Lupinus villosus	*Lady lupine*
Melilotus alba	*White sweet clover*

Melilotus indica	*Sour sweet clover*
Pithecellobium keyense	*Blackbead*
Pithecellobium unguis-cati	*Cat claw*
Sophora tomentosa	*Necklace pod*
Stylosanthes hamata	*Southern pencil flower*
Trifolium repens	*White clover*
Vicia acutifolia	*Vetch*
Vicia floridana	*Florida vetch*
Gaylusscia dumosa	*Dwarf huckleberry*
Lyonia lucida	*Fetterbush*

Trees for Native Landscaping

Botanical Name	**Common Name**
Coccothrinax argentata	*Silver palm*
Roystonea elata	*Royal palm*
Sabal etonia	*Scrub palmetto*
Sabal minor	*Dwarf palmetto*
Sabal palmetto	*Cabbage palm*
Sabal repens	*Saw palmetto*
Thrinax morrisii	*Key thatch palm*
Thrinax radiata	*Florida thatch palm*
Ficus aurea	*Strangler fig*
Ficus citrifolia	*Shortleaf fig*
Morus rubra	*Red mulberry*
Trema floridanum	*Florida trema*
Carya aquatica	*Water hickory*
Carya floridana	*Scrub hickory*
Magnolia grandiflora	*Southern magnolia*
Magnolia virginiana	*Sweetbay*
Quercus nigra	*Water oak*
Quercus virginiana	*Live oak*
Diospyros giniana	*Persimmon*
Coccoloba diversifolia	*Pigeon plum*
Coccoloba uvifera	*Sea grape*
Pinus clausa	*Sand pine*
Pinus elliottii	*Slash pine*
Pinus palustris	*Longleaf pine*
Juniperus silicicola	*Southern red cedar*
Nyssa aquatica	*Water tupelo*
Nyssa ogeche	*Ogeechee tupelo*
Lysiloma bahamense	*Wild tamarind*
Pithecellobium keyense	*Blackbead*
Pithecellobium unguis-cat	*Cat claw*

Appendix G
Florida Bonnetted Bat Management Plan

Management Plan for Florida Bonneted Bat
For Homestead Air Reserve Base, FL

Introduction

The federally endangered Florida bonneted bat (FBB; *Eumops floridanus)* is confined to a small range in south Florida. FBB are extremely rare and have the smallest known distribution of any new world bat, inhabiting only a few counties in south Florida. These bats prefer old trees with suitable cavities or crevices, but also roost in Spanish tile roofs or bat houses of appropriate design. A bat survey recently conducted on a parcel adjacent to HARB observed FBB presence; however roost sites were not identified. In late 2015, a female FBB mortality was discovered on the HARB airfield. A necropsy conducted by Zoo Miami concluded the cause of death to be blunt trauma but did not speculate causes (Appendix A). In an effort to determine the species' usage of the base, HARB plans an acoustic bat survey for 2016 (Appendix B). Information obtained in this and other studies will be utilized to revise and adapt this plan to best protect FBB on HARB. At the time of this writing, the USFWS is developing best management practices to support conservation of FBB and HARB will partner with the Service to establish management practices that conserve the species and continue to support the military mission. HARB will work to incorporate the following protective measures into installation activities in order to prevent impacts to FBB and its habitat.

Conservation of Wetlands

HARB will make efforts to conserve and protect open freshwaters, wetlands, and associated riparian habitat to promote foraging opportunities for FBBs. The HARB INRMP describes the distribution of wetlands on the installation (Section 5.6) and outlines protective measures for the installation (Section 7.7). All wetlands on HARB are protected under the Clean Water Act and actions which alter or disturb wetlands are coordinated through the appropriate state and federal agencies. Maintenance of wetland habitat is coordinated through the Landscape Maintenance Plan or Pest Management Plan, and activities performed under these plans will be fully coordinated with HARB natural resources and personnel working under these plans will be briefed on FBB conservation measures.

Promote insect diversity and availability

Due to the near absence of potential roosting habitat on HARB, bat usage of the installation is thought to be almost exclusively foraging. Little is known regarding the diet preferences of FBB but we do know that they primarily feed on flying insects. The necropsy conducted on the mortality collected on HARB in 2015 identified beetles in the stomach contents (Appendix A), suggesting a preference for larger insects. In order to learn more about this species' foraging preferences, more studies need to be conducted. Airfield staff have been briefed and instructed to collect and preserve all bat mortalities discovered on the airfield. Mortalities will be sent to Zoo Miami for necropsy and study. Until such time as the foraging preferences of FBB are identified, HARB will continue to closely regulate insecticide use, mowing, and other maintenance practices that might reduce the availability of forage for FBB on the installation.

Guidelines outlined in the HARB INRMP (Sections 7.8 and 7.12), Pest Management Plan, Landscape Maintenance Plan, and the Protected Plant Management Plan will be closely monitored and adapted as life history data for FBB becomes available. When compatible with mission requirements, HARB will promote the use of environmentally friendly lighting practices to minimize impacts to FBB.

Protection of Roosting Habitat

Roosting sites have not been verified for FBB on HARB, however potential roosting habitat exists. FBB have been documented to roost in tree cavities, palm fronds, Spanish tiles, and crevices in rock outcroppings. Few of these features exist on HARB, however Banyan trees (need species name) are present and may provide suitable roosting habitat. Several structures on HARB present suitable roosting locations for FBB as well. Roosting habitat can be located and identified based on one or more of the following criteria: bonneted bats observed emerging from cavity, bat vocalizations ("chattering") have been heard from or in the vicinity of a tree/snag/roost site, large bats (>13 cm in length) have been seen flying, the tree/snag/roost site exudes an ammonia-like smell, or bat guano has been observed at the base of a tree/snag/roost site.

Once identified as roosting habitat, HARB will protect known and historic roost trees/snags, regardless of occupation by bats, by establishing a buffer around the roost to ensure that roost sites remain suitable for the FBB. Buffer sizes and other protective measures will be coordinated with the USFWS and opportunities to study the species will be supported. The Landscape Maintenance Plan will be updated to include FBB conservation and landscape staff will be briefed on FBB avoidance and protection measures.

If bats are observed roosting within structures on HARB, natural resources staff will coordinate with the USFWS on removal measures prior to conducting actions that may affect the bats' behavior or wellbeing. HARB will seek to utilize and incorporate engineering designs that discourage bats from using buildings or structures for roosting.

Fire management is extremely limited on HARB; however if roost habitat occurs within a burn block, efforts will be made to prevent roosting trees or snags from catching fire and limit exposure of the roosting bats to heat or smoke. Management actions will include marking and avoiding roost trees/snags during mechanical treatment or firebreak creation, raking flammable material away from the base of roost trees/snags, ignition of backing fires in the vicinity of the roost tree/snag to reduce fire intensity, and post-fire monitoring to ensure preservation of roost sites. Protection of FBB roosting sites will be incorporated into the proposed Wildfire Management Plan for HARB (INRMP Objective 1.6).

Monitoring Florida bonneted bat on HARB

Adaptive management is the backbone of effective conservation programs and monitoring data is essential to inform the process. HARB has proposed and initiated preliminary acoustic monitoring survey that will determine presence of FBB on the installation and help identify hotspots in bat usage. Data obtained from this study will inform HARB natural resources staff

such that appropriate revisions and adjustments can be made to the existing management plans or future actions as they occur on the base. This study is the initial step in establishing a continued FBB monitoring program and HARB will seek funding and partner support for routine monitoring that will provide a temporal component to FBB usage and behavior on the installation.

While acoustic surveys will be essential in documenting foraging locations and bat behavior, these methods are insufficient to precisely identify roosting sites. Acoustic data will be used to identify hotspots in FBB activity at dusk, when bats are emerging from roost to forage. Utilizing the criteria outlined above, roost sites will be identified and HARB will work with the USFWS to define regular monitoring protocols. Documentation of roost sites is much more labor intensive than acoustic surveys and HARB will seek funding and partnership opportunities to accomplish this task. As roosting habitat is identified, HARB will adapt this plan to incorporate more specific protection and avoidance measures for FBB at these sites on the installation. HARB will work with USFWS, FFWCC, and other partners to develop and implement bat monitoring programs that inform management and recovery decisions for FBB while continuing to accomplish the military mission.

Appendix A: Zoo Miami Necropsy Report

Dec. 17, 2015

History: This *Eumops floridanus* specimen was found deceased on the south end runway on over-run at around 0800hrs on Dec. 15th 2015 at the Homestead Air Reserve Base. Latitude: 25.477896, Longitude: -80.396923. The specimen was preserved through freezing and transported to Zoo Miami around 1515hrs on Dec. 17th 2015 for a necropsy.

Wt: 32.3 gm

Tip to tip wingspan: 43cm

Nose to tail base body length: 9cm

Nose to tail tip body length: 14.3cm

Gross examination: The specimen appears to be in good body condition. It is a female with no signs of mammary development. Dentition is sharp with no staining. The left maxillary canine shows pulpitis and red discoloration. There is a mid-shaft open fracture of the 4th right, 2nd phalange. Haircoat dorsally is gray/black and white/light grey on the ventrum. There is a large subcutaneous hematoma on the ventral aspect of the right leg that extends from the stifle to the inguinal area and a large clot can be visualized under the skin. There is a small skin tear over the right stifle exposing the underlying tissues with little hemorrhage seen. There is a large open dermal tear on the ventrum extending from the right shoulder to the left axillary and a second parallel dermal tear from the right axillary to the left caudal aspect of the rib cage. Extensive subcutaneous and muscular hemorrhage is associated with these wounds. There is a liver fracture in the right lobe with associated hemorrhage into the peritoneal cavity. The intestines have poor definition that could be an artifact of freezing. The stomach is full of ingesta and ingesta is also present throughout the intestines. There is a hemothorax with bilateral hemorrhage present in the lungs. The heart is dark red and there appears to be hemorrhage within the cardiac muscle. The reproductive tract appears to be small and quiescent.

Diagnosis: This young female bat appears to have suffered blunt trauma to its ventrum that resulted in significant organ trauma and hemorrhage. There was also an open fracture of one of the small bones in the right wing. The lack of teeth staining, sharpness of the teeth, and lack of evidence of prior reproduction indicates that this is a young bat, likely a year or less in age. The full stomach and good body condition correlates with the injuries being acute.

Specimens saved: A representative sample of the major organs and tissues (except the brain) were preserved in formalin for submission to a histopathologist. Interpretation will be limited due to the prior freezing. Three skin and muscle samples were

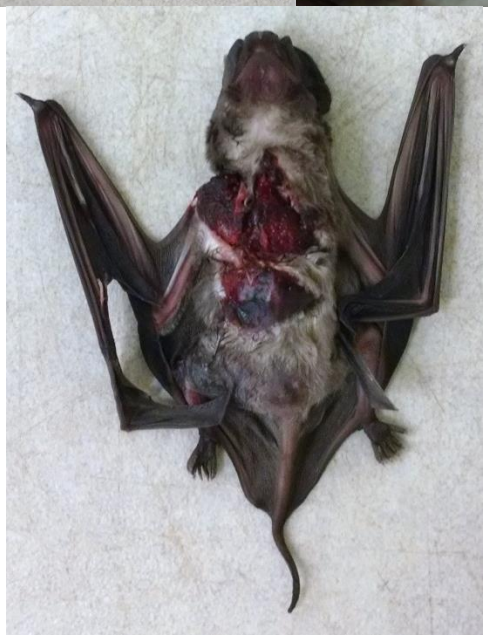
OUR MISSION:

To encourage an appreciation for the world's wildlife and to help conserve it for future generations.

One Zoo Boulevard
12400 SW 152 Street
Miami, FL 33177-1499
Tel: 305-251-0400
Fax: 305-378-6381

www.zoomiami.org

preserved in 95% ethyl alcohol for future genetic testing. Stomach contents were preserved in 95% ethyl alcohol for prey identification through microscopic or genetic analysis (preliminary dissection microscope examination showed an abundant amount of fine pieces of beetle elytra). The carcass will be preserved in a freezer at the Zoo Miami's Conservation and Research Department until shipped to the Florida Museum of Natural History when they are ready to receive.



Frank Ridgley DVM
Conservation and Research Department
Zoo Miami

Appendix B: Draft Florida Bonneted Bat Acoustic Survey Study Plan

Draft Acoustic Survey Protocol for the Florida Bonneted Bat **August 2014**

The purpose of this survey is to document if Florida bonneted bats have a reasonable likelihood of using a proposed project site. The results of the surveys will provide information that can help guide the consultation process and appropriate conservation measures. Because of the difficulty in detecting this species, negative survey results will not equate to species absence. This protocol is designed to be implemented prior to potential impacts from construction or development projects. Because the Florida bonneted bat Consultation and Focal Area (Appendix A) was developed around confirmed Florida bonneted bat detections, an agency or applicant may choose to assume presence of Florida bonneted bats rather than implement acoustic surveys. Acoustical methods have been selected over mist netting as the primary survey methodology because this species flies and primarily forages at heights of 9 m (30 ft) or more; for this reason the species can be difficult to capture in mist nets.

The South Florida Ecological Services Field Office (Service) is available to review survey plans for the Florida bonneted bat and can provide recommendations on appropriate placement of bat detectors. Survey plans should include a map/aerial photo identifying the proposed project area boundaries, suitable bat habitat and acreages within the proposed project area, and the proposed number and tentative locations of acoustic monitoring sites.

TIMING:
Year-round: Acoustic surveys can be conducted in all months of the year, provided the minimum temperature stays above 60 degrees throughout the night.

SURVEY PERIOD:
Sunset-Sunrise - The acoustic sampling period for each sampling night begins at sunset and ends at sunrise for each detector. Sunset tables for the location of survey can be found at:
http://aa.usno.navy.mil/data/docs/RS_OneYear.php

SURVEY EFFORT: The following will be considered the minimum level of survey effort.

- To determine the acoustic survey effort, quantify the amount of suitable habitat[1] within the proposed project area.
- The number of acoustic survey sites required for a project will be dependent upon the overall acreage of suitable habitat in the proposed project site.
- Detectors should be placed adjacent to features known to attract bats, such as water features, or within active or historic red-cockaded woodpecker clusters.
- Once a Florida bonneted bat has been detected, surveys of the proposed project area can be discontinued because presence of the species has been established.

[1] ***Roosting habitat*** includes forest and other areas with large or mature trees or other areas with suitable roost structures. Natural roosting structure primarily includes mature or large live or dead trees, tree snags, and trees with cavities, hollows, or crevices. Forest is defined as all types (all age classes) including: pine flatwoods, scrubby flatwoods, pine rocklands, royal palm hammocks, mixed or hardwood hammocks, cypress, sand pine scrub, or other forest types. ***Foraging habitat*** includes open fresh water and permanent or seasonal freshwater wetlands (which provide sources of drinking water and prey), wetland and upland forests, open freshwater wetlands, wetland and upland shrub (which provide a prey base and suitable foraging conditions [i.e., open habitat structure]). Natural or semi-natural habitat patches in urban or residential areas may also provide foraging habitat.

Linear projects: Linear projects are defined as roadways, transmission lines, etc. 5 detector nights per km (0.6 miles) of suitable habitat are required. Detectors should be distributed along the linear feature. Detectors can be moved to multiple locations within each kilometer surveyed but must remain in a single location throughout any given night. Detectors should not be placed closer than 200 meters apart.

Non-linear projects: A minimum of 16 detector nights per 20 acres of suitable habitat are required. If multiple detectors are used they should be placed a minimum of 200 meters apart. Projects less than 20 acres should still sample for a minimum of 16 nights

DETECTOR TYPE

Detectors suitable for use in this survey protocol include:

- Full-spectrum and/or zero-crossing detectors.
- Directional and omni-directional microphones.
- Microphones attached to detectors via a cable permitting that the cable length does not exceed manufacturer recommendations.
- Microphones should be mounted on grounded or metal poles to avoid build-up of electrostatic charges that may interfere with acoustic sampling.

DETECTOR PLACEMENT

Detector/Microphone placement is critical to the successful isolation of high-quality bat call sequences for later analysis. Accurate GPS coordinates must be generated and reported for each acoustic survey site. We recommend selecting deployment locations in consultation with the Service.

The following locations are likely to be suitable sites for detectors/microphones, including, but not limited to:

- forest-canopy openings
- near open water or vegetated wetlands
- wooded fence lines that are adjacent to large openings or connect two larger blocks of suitable habitat
- blocks of recently logged forest where some potential roost trees remain
- road and/or stream corridors with open tree canopies or canopy height of more than 10 m (33 ft)
- forest edges (Britzke et al. 2010)

<u>Detectors/Microphones Deployment</u>

The following considerations address microphone height and directionality:

- at a minimum height of 5 m (16.4 ft); consider using vertical structures, when present, to establish greater height in detector/microphone placement;
- a minimum of 1.5 m (5 ft) in any direction from vegetation or other obstructions, and not under a tree canopy (Hayes 2000; Weller and Zabel 2002);
- in areas without, or with minimal[2], vegetation within 10 m (33 ft) in front of the

[2] If necessary, surveyors can remove small amounts of vegetation (e.g., small limbs, saplings) from the estimated

microphone; and
- spaced a minimum of 200 m (656 ft) apart.

Orientation
Detectors with directional microphones should be aimed 90 degrees above horizontal.

Weather Conditions
At a minimum, nightly weather conditions for survey sites should be checked using the nearest NOAA National Weather Service station and summarized in the survey reports.

If any of the following weather conditions exist at a survey site during acoustic sampling, note the time and duration of such conditions, and repeat the acoustic sampling effort for that night.
- temperatures fall below 60°F during the night;
- precipitation, including rain and/or fog, that exceeds 30 minutes or continues intermittently during the night; and
- sustained wind speeds greater than 9 miles/hour (4 meters/second; 3 on Beaufort scale) during the night.

Verification of Proper Functioning
Ensure acoustic detectors are functioning properly and conduct tests on microphone sensitivity to factory specifications before and after deployment, at a minimum. It is recommended that tests be conducted throughout the survey period.

SUBMISSION OF ACOUSTIC SURVEY RESULTS
Results of the acoustic surveys should be submitted to the Service using the data sheets and excel table provided, along with all raw data (i.e., zero crossing files, wave files and sonograms). In addition to the excel table, data sheets, and raw files, each acoustic survey report should include the following:

1. Description of the habitat within the proposed project area. Use Florida Land Use Cover and Forms Classification System descriptions of habitat types.

2. Photographs of each acoustic site documenting: 1) the habitat in which the acoustic units were deployed; 2) the deployment location/position of the acoustic unit; 3) the orientation of the microphone at deployment.

3. Map identifying acoustic monitoring locations and a corresponding GPS coordinates.

4. Full names of all personnel conducting acoustic surveys, including those that selected acoustic sites and deployed detectors.

5. Description of acoustic detector brand(s) and model(s) used, microphone type, use of weatherproofing, acoustic monitoring equipment settings (e.g., sensitivity, audio and data

---

detection cone at a site. Deployment of detectors/microphones in closed-canopy locations are acceptable as long as the area sampled below the canopy does not restrict the ability of the equipment's detection cone to record high-quality calls (i.e., the vegetation is outside of the detection cone).

division ratios).

6. A description of how proper functioning of bat detectors was verified.

ADDITIONAL CONSIDERATIONS

Placement and Microphone Orientation

Many features (e.g., vegetation, water, wind turbines, high-tensile power-lines, micro-wave towers) can reduce the quality of call sequences recorded in the field and impact the surveyor's ability to record high-quality bat call sequences by causing calls to reflect off of these surfaces.

It is important to assess the volume and area of highest sensitivity within the zone of detection around the microphone to ensure the best detector/microphone placement and orientation. If detectors/microphones are placed in unsuitable locations, effective data analysis may be impossible, and the results of the sampling effort will likely be invalid.

Selection of acoustic sites is also important. Suitable set-up of the equipment should result in high-quality call sequences that are adequate for species identification. Modifications of the equipment (e.g., changing the orientation) at the same location on subsequent nights may improve quantity and quality of call sequences recorded, which can be determined through daily data downloads. If modifications of the equipment do not improve call identification, then the detectors will need to be moved to a new location.

Field Tests

It is required to ensure equipment is working during set-up in the field. This can be done simply by producing ultrasound (e.g., finger rubs, calibrator, or follow the equipment manufacturer's testing recommendations) in front of the microphone at survey start and survey finish. This documents that the equipment was working when deployed and when picked up (and by assumption throughout the entire period). Detector field settings (e.g., sensitivity, frequency, etc.) should follow the recommendations provided by the manufacturer. Surveyors should also save files produced by detectors (e.g., log files, status files, sensor files) as an excellent way to provide documentation when equipment was functioning within the survey period. Many types of detectors allow for setting timers that initiate and end recording sessions. This saves battery life as well as reducing the number of extraneous noise files recorded. However, if the units are visited when the timer is off, the surveyor cannot verify that the unit is functioning properly. This is particularly important in areas where no bat activity is recorded for the entire night or during the last portion of the night. In these cases, if the surveyor cannot demonstrate that the detector was indeed functioning properly throughout the survey period, then the site will need to be re-sampled unless adequate justification can be provided to the Service.

PERSONNEL

Acoustic surveyors should have either completed one or more of the available acoustic courses/workshops (e.g., Bat Conservation International, Bat Conservation and Management, AnaBat™) or be able to show similar on-the-job or academic experience. The proceeding workshops and course are all independently conducted and should be contacted directly; the Service is not

affiliated with any of the workshops or courses and does not have additional information.

Acoustic surveyors should have a working knowledge of the acoustic equipment and Florida bonneted bat ecology. Surveyors should be able to identify appropriate detector placement sites and establish those sites in the areas that are most suitable for recording high-quality Florida bonneted bat calls. Thus, it is highly recommended that all potential acoustic surveyors attend appropriate training and have experience in the proper placement of their field equipment.

Individuals qualified to conduct qualitative analysis of acoustic bat calls typically have experience: (1) gathering known calls. This provides a valuable resource in understanding how bat calls change and the variation present in them; (2) identifying bat calls recorded in numerous habitat types; (3) familiarity with the species likely to be encountered within the project area; and (4) individuals must have multiple years of experience and must have stayed current with qualitative ID skills. A resume (or similar documentation) will be required to be submitted along with final survey reports for anyone making final qualitative identifications.

REFERENCES

Britzke, E.R, B.A. Slack, M.P. Armstrong, and S.C. Loeb. 2010. Effects of orientation and weatherproofing on the detection of bat echolocation calls. Journal of Fish and Wildlife Management 1(2):136-141.

Hayes, J. P. 2000. Assumption and practical considerations in the design and interpretation of echolocation-monitoring studies. Acta Chiropterologica 2:225-236.

Weller, T. J., and C. J. Zabel. 2002. Variation in bat detections due to detector orientation in a forest. Wildlife Society Bulletin 30:922-930.

Addendum

Appendix H
Supplemental Tables

TABLE H-1
HARB Master Plant List (Native and Non-Native Species)
HARB Integrated Natural Resources Management Plan

Scientific Name	**Common Name**	***Scientific Name***	**Common Name**
Acrostichum danaeifolium	Leather fern	*Mikania batatifolia*	Hempweed
Agalinis harperi	False foxglove	*Melanthera parvifolia*	Melanthera
Albizia sp.	Mimosa or silk tree	*Metopium toxiferum*	Poisonwood
Andropogon glomeratus	Bushy beardgrass	*Mint* sp.	Mint
Andropogon virginicus	Broom sedge	*Morinda royoc*	Cheese plant
Angadenia berteroi	Pineland golden trumpet	*Muhlenbergia filipes*	Muhly grass
Anemia adiantifolia	Pine fern	*Myrica cerifera*	Wax myrtle or bayberry
Anthemis cotula	Dog fennel	*Myrsine floridana*	Myrsine
Ardisia elliptica	Shoebutton ardisia	*Odontosoria clavata*	Wedgelet fern
Ardisia escallonioides	Marlberry	*Nephrolepis* sp.	Sword fern
Ardisia solanacea	Shoebutton	*Neyraudia reynaudiana*	Burma reed
Aster sp.	Aster	*Panicum repens*	Torpedo grass
Baccharis halimifolia var angustior	Saltbush	*Parthenium hysterophorus*	Santa Maria
Bacopa caroliniana	Water hyssop	*Parthenocissus quinquefolia*	Virginia creeper
Bidens pilosa var. *radiata*	Beggar ticks	*Paspalum notatum*	Bahia grass
Bletia purpurea	Pinepink	*Passiflora suberosa*	Corky-stemmed passionflower
Bourreria terminalis	Everglade false buttonweed	*Pennisetum purpureum*	Napier grass
Borrichia frutescens	Sea ox-eye daisy	*Persea americana*	Bay or Avocado
Bougainvillea glabra	Bougainvillea	*Phoenix dactylifera*	Date palm
Brassaia actinophylla	Schefflera	*Phyla stoechadifolia*	Southern fogfruit
Bursera simaruba	Gumbo limbo	*Phychotria nervosa*	Wild coffee
Byrsonima lucida	Locust berry	*Phyllanthus pentaphyllus* ssp *floridanus*	Florida five-petaled leaf-flower
Callicarpa americana	Beautyberry	*Pinus elliottii (var. densa)*	Slash pine
Calopogon pulchellus var *simpsonii*	Grass-pink	*Pluchea rosea*	Godfrey's fleabane
Cassia bahamensis	Senna	*Poinsettia cyathophora*	Painted leaf

TABLE H-1
HARB Master Plant List (Native and Non-Native Species)
HARB Integrated Natural Resources Management Plan

Scientific Name	**Common Name**	***Scientific Name***	**Common Name**
Casuarina equisetifolia	Australian pine	*Poinsettia pinetorum*	Rockland painted leaf
Cenchurs sp.	Sandspur	*Poinsettia heterophylla*	Wild poinsettia
Centella asiatica	Coinwort	*Polygala boykinii* var *boykinii*	Milkwort
Chamaesyce conferta	Everglades Key sandmat	*Polygala grandiflora* var *leiodes*	Milkwort
Chamaesyce hypericifolia	Graceful sandmat	*Pontederia cordata*	Pickerelweed
Chamaesyce hyssopifolia	Hyssopleaf sandmat	*Psidium longipes*	Long-stalked stopper
Chamaesyce mendezii	Mendez's sandmat	*Psilotum nudum*	Whisk fern
Chamaesyce porteriana	Porter's spurge	*Psychotria undata*	Wild coffee
Chaptalia albicans	White sunbonnets	*Pteris bahamensis*	Bahama ladder brake fern
Chrysobalanus icaco	Coco plum	*Pteris* sp.	Fern
Chrysophyllum oliveform	Satin leaf	*Pteris vittata*	Brake fern
Cirsium sp.	Thistle	*Pteridium aquilinum (var. caudatum)*	Braken fern
Cladium jamaicense	Sawgrass	*Randia aculeata*	Indigo berry
Coccoloba uvifera	Sea grape	*Rhoeo spathacea*	Oyster plant
Coccothrinax argentata	Silver palm	*Rhus copallina*	Winged sumac
Crossopetalum ilicifolium	Christmas berry	*Rhynchosia parvifolia*	Small-leaf snoutbean
Crotalaria pumila	Rattlebox	*Rhynchospora (Dichromena) floridensis*	White-top sedge
Croton linearis	Pineland croton	*Rhynchospora sp.*	Beak rush
Cuscuta gronovii	Dodder or love vine	*Ricinus communis*	Castor bean
Cynanchumblodgettii	Blodgett's swallowwort	*Sabal minor*	Blue stem
Cynodon dactylon	Bermuda grass	*Sabal palmetto*	Cabbage palm
Cyperus sp.	Umbrella sedge	*Sabatia grandiflora*	Large-flowered sabatia
Desmodium sp.	Tick trefoil	*Sachsia bahamensis*	Bahama sachsia
Dipholis salicifolia	Willow bustic	*Sagittaria lancifolia*	Duck potato
Dodonaea viscosa	Varnish leaf	*Samolus ebracteatus*	Water pimpernel
Eleocharis cellulosa	Spike rush	*Schinus terebinthifolius*	Brazilian pepper

TABLE H-1
HARB Master Plant List (Native and Non-Native Species)
HARB Integrated Natural Resources Management Plan

Scientific Name	**Common Name**	***Scientific Name***	**Common Name**
Equisetum sp.	Horsetail	*Schizachyrium rhizomatum*	Florida Bluestem
Eugenia axillaris	White stopper	*Schoenus nigricans*	Black rush
Eupatorium capillifolium	Dog fennel	*Scutellaria havanensis*	Skullcap
Eupatorium coelestinum	Ageratum	*Selaginella armata* var. *eatonii*	Eaton's spike-moss
Eupatorium odoratum	Boneset	*Selaginella sp.*	Moss
Ficus aurea	Strangler fig	*Senna bicapsularis*	Butterfly bush
Ficus citrifolia	Shortleaf fig	*Senna mexicana* var. *chapmanii*	Bahama senna
Fimbristylis cymosa (var. spathacea)	Hurricane grass	*Serenoa repens*	Saw palmetto
Flaveria linearis	Yellowtop	*Setaria lutescens (or parviflora)*	Foxtail
Forstiera segregata var pinetorum	Florida privet	*Sisyrinchium atlanticum*	Blue-eyed grass
Galactia smallii	Small's milkpea	*Smilax laurifolia*	Bamboo vine or catbrier
Guapira discolor	Beef tree	*Smilax havanensis*	Greenbrie r
Guettardia scabra	Velvet seed	*Solanum blodgettii*	Blodgett's nightshade
Hydrocotyle bonariensis	Pennywort	*Solanum erianthum*	Potato tree
Hypericum brachyphyllum	Mint		
Hypericum hypericoides var hypericoides	St. Andrew's cross	*Solanum macranthum*	Giant potato tree
Hyptis alata	Musky mint	*Spermacoce terminalis*	Everglades false buttonweed
Ilex cassine	Dahoon holly	*Stenotaphrum secundatum*	St. Augustine Grass
Ilex krugiana	Krug's holly	*Stachytarphetta jamaicensis*	Blue porterweed
Ipomoea hederifolia	Morning glory	*Stylosanthes calcicola*	Everglades key pencilflower
Ipomoea microdactyla	Wild potato morning glory	*Swietenia mahagoni*	Mahogany
Jacquemontia curtissii	Pineland jacquemontia	*Tetrazygia bicolor*	Tetrazygia
Lantana camara	Shrub verbena	*Tragia saxicola*	Rocklands noseburn
Lantana depressa	Florida lantana	*Trema lamarck iana*	West Indian trema
Lantana involucrata	Wild sage	*Trema micranthum*	Florida trema

TABLE H-1
HARB Master Plant List (Native and Non-Native Species)
HARB Integrated Natural Resources Management Plan

Scientific Name	**Common Name**	***Scientific Name***	**Common Name**
Leucaena leucocephala	Leadtree	*Toxicodendron radicans ssp radicans*	Poison ivy
Linum arenicola	Sand flax	*Typha domingensis*	Southern cattail
Linum carteri	Everglades flax	*Vernonia blodgettii*	Blodgett's ironweed
Lippia nodiflora	Cape weed	*Vitis rotundifolia*	Muscadine grape
Magnolia sp.	Magnolia	*Waltheria indica*	Uhaloa
Melaleuca quinquenervia	Melaleuca	*Wedelia trilobata*	Creeping ox-eye
		Zeuxine strateumatica	Lawn orchid

TABLE H-2
State Listed Plant Species
HARB Integrated Natural Resources Management Plan

State Status	Common Name	Scientific Name	Habitat Type	Habitat Potential on HARB
T	Golden leather fern	*Acrostichum aureum*	Brackish and freshwater marshes	Low
E	Fragrant maidenhair fern	*Adiantummelanoleucum*	Sides of limestone sinks	Low
E	Brittle maidenhair fern	*Adiantumtenerum*	Limestone sinkholes and rocky hammocks	Medium
E	Meadow jointvetch	*Aeschynomene pratensis*	Marl prairie, cypress domes, swales	Low
E	Bracted colic-root	*Aletris bracteata*	Savannas, openings within pine woodland-savanna mat	Low
E	Everglades leaf lace	*Alvaradoa amorphoides*	Pine rocklands and transition zones with rockland hammocks	Medium
E	Wright's anemia	*Anemia wrightii*	Limestone pinnacles, walls of solution holes, pine rocklands, and rockland hammocks	Low
T	Pineland golden trumpet	*Angadenia berteroi*	Pine rocklands	High
E	Sea lavender	*Argusia gnaphalodes*	Sand dunes	Low
E	Marsh's Dutchman's pipe	*Aristolochia pentandra*	beach strands and coppices, saline margins and sea cliffs	Low
E	American toothed spleenwort	*Asplenium dentatum*	Tropical hardwood hammocks and on limestone outcrops and walls of limesinks	Low
E	American bird's nest fern	*Asplenium serratum*	Fallen logs, stumps, and tree trunks in cypress swamps and tropical rockland hammocks	Low
E	Modest spleenwort	*Asplenium verecundum*	Rockland hammocks, limestone outcrops, grottoes, and sinkholes	Low
E	Rockland orchid	*Basiphyllaea corallicola*	Solution holes in grassy openings in pine rockland; leaf litter in rockland hammock	Medium
E	Coast Rican ladies'-tresses	*Beloglottis costaricensis*	Shady interiors of tropical hardwood hammocks	Medium

TABLE H-2
State Listed Plant Species
HARB Integrated Natural Resources Management Plan

State Status	Common Name	Scientific Name	Habitat Type	Habitat Potential on HARB
T	Pinepink	*Bletia purpurea*	Rocky crevices in coral pinelands, grassy hills, wet cliffs, in swamps on base of trees, or on floating mats of vegetation	High
E	Smooth strongbark	*Bourreria cassinifolia*	Pine rocklands	Medium
T	Locustberry	*Byrsonima lucida*	Pine rocklands, rockland hammock and edges	High
E	Myrtle-of-the-river	*Calyptranthes zuzygium*	Rockland hammocks, coastalberm	Medium
E	Powdery catopsis	*Catopsis floribunda*	Tropical hammocks and cypress swamps	Low
E	Many-flowered Catopsis	*Catopsis floribunda*	Tropical hammocks and cypress swamps	Low
E	Porter's broad-leafed spurge	*Chamaesyce porteriana*	Pine rocklands, rockland hammock, coastalrock barrens, marl prairie	High
T	White sunbonnets	*Chaptalia albicans*	Pine rocklands	High
T	Silver palm	*Coccothrinax argentata*	Pine-palmetto rocklands on oolite, hardwood-palmetto scrub and coppice, hardwood-palmetto-cactus coastal scrub, open shrubby coastalscrub on oolite, and near-coastalhillside woodlands	High
E	Cuban snake-bark	*Colubrina cubensis var. floridana*	Edges of rockland hammocks and pine rocklands	Medium
T	Christmas berry	*Crossopetalumilicifolium*	Along the edges of hammocks	High
T	Rhacoma	*Crossopetalumrhacoma*	Margins of coastal hammocks	Medium
E	Florida tree fern	*Ctenitis sloanei*	Inland hammock forests	Medium
E	Tall neottia	*Cyclopogon elatus*	Hammock interior; tropical hardwood hammocks	Medium
E	Cowhorn orchid	*Cyrtopodiumpunctatum*	Trunks and stumps of cypress trees in swamps, branches of buttonwood trees in coastal hammocks, and occasionally pine rocklands and marl prairies	Medium

TABLE H-2
State Listed Plant Species
HARB Integrated Natural Resources Management Plan

State Status	Common Name	Scientific Name	Habitat Type	Habitat Potential on HARB
T	Blodgett's swallowwort	*Cynanchumblodgettii*	Pine hammocks and pine-palmetto hammocks	High
E	Milkbark	*Drypetes diversifolia*	Tropical hammocks in the Keys	Low
E	Spurred neottia	*Eltroplectris calcarata*	Mesic hammock, rockland hammock	Medium
E	Dollar orchid	*Encyclia boothiana* var. *erythronioides*	Tropical hammocks and mangroves	Medium
E	Clamshell orchid	*Encyclia cochleata*	Trunks and branches of pond apple, cypress, live oak, and buttonwood trees in swamps and hammocks	Low
E	Night-scented orchid	*Epidendrumnocturnum*	Tree trunks, branches, and stumps in hammocks, swamps, and sloughs	Low
E	Coker's beach creeper	*Ernodea cokeri*	Pine rocklands	Medium
E	Tropical ironwood	*Eugenia rhombea*	Rockland hammock	Medium
E	Villose fennel	*Eupatoriumfrustratum*	coastalrock barrens and berms, sunny edges of rockland hammock	Medium
E	Rockland painted-leaf	*Euphorbia pinetorum*	Pine rocklands	Medium
E	Two-keeled helmet orchid	*Galeandra bicarinata*	Hammocks	Medium
E	Coastal vervain	*Glandularia tampensis*	Sandy clearings in coastaldune swales, scrub, pinelands, and open live oak-cabbage palm woods	Medium
E	Sheathing govenia	*Govenia floridana*	Tropical hammocks	Medium
E	Lignum-vitae	*Guaiacum sanctum*	Rockland hammocks	Medium
E	Fakahatchee Guzmania	*Guzmania monostachia*	Branches and tree trunks in swamps and wet hammocks	Low
E	Simpson's prickly apple	*Harrisia simpsonii*	Higher coastal hammock islands of Florida Bay, mangrove swamps, thickets, buttonwood	Low

TABLE H-2
State Listed Plant Species
HARB Integrated Natural Resources Management Plan

State Status	Common Name	Scientific Name	Habitat Type	Habitat Potential on HARB
E	Manchineel	*Hippomane mancinella*	Coastal berms and hammocks in brackish areas just inland of the mangrove zone	Low
E	White ironwood	*Hypelate trifoliata*	Rockland hammocks	Medium
T	Krug's holly	*Ilex krugiana*	Hammocks in Everglade keys of Florida, rockland hammock, pine rockland and also in disturbed areas	High
E	Wild potato morning glory	*Ipomoea microdactyla*	Pine rocklands	High
E	Rocklands morning glory	*Ipomoea tenuissima*	Pine rocklands	Medium
T	Pineland jacquemontia	*Jacquemontia curtissii*	Pine rocklands, marl prairie, spoil banks, and mesic flatwoods	High
E	Skyblue clustervine	*Jacquemontia pentanthos*	Pine rockland, edges of rockland hammock, disturbed openings in hammocks, coastalrock barren	Medium
T	Joewood	*Jacquinia keyensis*	Coastal hammocks	Low
E	Small-headed lantana	*Lantana canescens*	Transition zones between rockland hammock and pine rockland	Medium
E	Florida lantana	*Lantana depressa* var. *depressa*	Pine rocklands	High
E	Atlantic coast Florida lantana	*Lantana depressa* var. *floridana*	Dunes and sandy inland ridges	Low
E	Ghost plant	*Leiphaimos parasitica*	Tropical hardwood hammock forests and bayhead forests	Low
E	Gulf licaria	*Licaria triandra*	Rockland hammocks	Medium
E	Small's flax	*Linum carteri* var. *smallii*	pine rocklands, pine flatwoods, adjacent disturbed areas	High
E	Holly vine fern	*Lomariopsis kunzeana*	Epipetric in dark lime sinks	Low

TABLE H-2
State Listed Plant Species
HARB Integrated Natural Resources Management Plan

State Status	Common Name	Scientific Name	Habitat Type	Habitat Potential on HARB
T	Pineland black anthers	*Melanthera parvifolia*	Pine rocklands and coastalstrands of Florida's east coast and the Florida Keys	High
E	Climbing vine fern	*Microgramma heterophylla*	Hammocks	Medium
E	Wedgelet fern	*Odontosoria clavata*	Pine rocklands, sinkholes, limestone ledges, rocky glades	High
E	Burrowing four-o'clock	*Okenia hypogaea*	Ocean side of coastaldunes	Low
E	Florida dancinglady orchid	*Oncidium floridanum*	Rockland hammocks, cypress swamps	Medium
E	Hand fern	*Ophioglossumpalmatum*	Maritime hammocks and wet hammocks	Low
E	Florida semaphore cactus	*Opuntia corallicola*	Buttonwood zone between rockland hammock and coastalswamp;	Low
E	White passionflower	*Passiflora multiflora*	Tropical hammocks	Medium
E	Everglades key passionflower	*Passiflora sexflora*	Tropical hammocks	Medium
E	Mangrove mallow	*Pavonia paludicola*	Tidal swamp	Low
E	Blunt-leaved peperomia	*Peperomia obtusifolia*	Rockland hammocks, hydric hammocks, strand swamps	Medium
E	Mahogany mistletoe	*Phoradendron rubrum*	Parasitic on West Indian mahogany	Medium
E	Southern fogfruit	*Phyla stoechadifolia*	Marl prairies and glades	High
E	Bitter bush	*Picramnia pentandra*	Rockland hammocks	Medium
E	Ghost orchid	*Polyrrhiza lindenii*	Dense, wet subtropicalto tropical forests and hammocks	Low
E	Small-flowered prescotia	*Prescotia oligantha*	Deep shade of tropical and rockland hammock forests	Medium

TABLE H-2
State Listed Plant Species
HARB Integrated Natural Resources Management Plan

State Status	Common Name	Scientific Name	Habitat Type	Habitat Potential on HARB
T	West Indian cherry	*Prunus myrtifolia*	Open places, hammocks, pinelands, woodland margins on limestone	Medium
E	Florida cherry-palm	*Pseudophoenix sargentii*	Near sea level on well-drained limestone or sand in areas protected from wind	Low
T	Mangrove berry	*Psidium longipes*	Pine rockland, rockland hammock	High
E	Bahama wild coffee	*Psychotria ligustrifolia*	Rockland hammock	Medium
T	Bahama brake	*Pteris bahamensis*	Pine rocklands and the edges of rockland hammocks	High
T	Giant orchid	*Pteroglossaspis ecristata*	Sandhill, scrub, pine flatwoods, pine rocklands	Medium
T	Small-leaf snoutbean	*Rhynchosia parvifolia*	Pinelands, trails, and beaches	High
E	Florida royal palm	*Roystonea elata*	Tropical hammocks	Medium
T	Bahama sachsia	*Sachsia polycephala*	Pine rocklands	High
T	Fahkahatchee Ladies' - tresses	*Sacoila lanceolata* var. *paludicola*	Swamps and hydric hammocks	Low
E	Yellowwood	*Schaefferia frutescens*	Tropical hammock forests on upper Florida Keys	Low
E	Ray fern	*Schizaea pennula*	Wet, rich soil under saw palmetto & gallberry; rotten stumps & trunks of red bay; litter of red bay & dahoon islands	Low
E	Havana skullcap	*Scutellaria havanensis*	Rocky pinelands	High
E	Eaton’s spike moss	*Selaginella armata var. eatonii*	Moist limestone ledges and sinkhole margins in hammocks and moist pinelands	High
T	Bahamma senna	*Senna mexicana var. chapmanii*	Pine rocklands	High
T	Everglades greenbriar	*Smilax havanensis*	Pine rocklands	High
T	Everglades false buttonweed	*Spermacoce terminalis*	Pinelands	High

TABLE H-2
State Listed Plant Species
HARB Integrated Natural Resources Management Plan

State Status	Common Name	Scientific Name	Habitat Type	Habitat Potential on HARB
E	Green ladies'-tresses	*Spiranthes polyantha*	Rock outcrops in mesic hammock, rockla#nd hammock, maritime hammock	Medium
E	Southern ladies'-tresses	*Spiranthes torta*	Rock outcrops in mesic hammock, rockla#nd hammock, maritime hammock	Medium
E	Pineland pencil flower	*Stylosanthes calcicola*	Pine rocklands and marl prairies, especially the transition zones between these two communities	High
T	West Indies mahogany	*Swietenia mahagoni*	Subtropical dry or moist forest	High
E	Least Halberd fern	*Tectaria fimbriata*	Solution holes in limestone in rockland hammocks	Medium
E	Rockland hoary-pea	*Tephrosia angustissima* var. *corallicola*	Pine rocklands	Medium
E	Coastal hoary-pea	*Tephrosia angustissima* var. *curtissii*	Scrub and sandy areas	Medium
T	Florida clover ash	*Tetrazygia bicolor*	Pine rocklands	High
E	Creeping maiden fern	*Thelypteris reptans*	Limestone grottoes and sinkholes	Low
E	Stiff-leaved maiden fern	*Thelypteris sclerophylla*	Limestone grottoes and sinkholes	Low
E	Toothed maiden fern	*Thelypteris serrata*	Limestone grottoes and sinkholes	Low
E	Brittle thatch palm	*Thrinax morrisii*	Hammocks	Medium
E	Florida thatch palm	*Thrinax radiata*	Coastal thickets on limestone	Low
T	Banded wild-pine	*Tillandsia flexuosa*	Grows on hardwood shrubs and trees in wetlands	Low
T	Pineland noseburn	*Tragia saxicola*	Pine rocklands	High
E	Lamarck's trema	*Trema lamarckianum*	Disturbed areas along the margins of woodlands, roadways, and stream banks.	High
E	Kraus' bristle fern	*Trichomanes krausii*	Buttressed roots and tree bases in rockland hammocks	Medium

TABLE H-2
State Listed Plant Species
HARB Integrated Natural Resources Management Plan

State Status	Common Name	Scientific Name	Habitat Type	Habitat Potential on HARB
T	Florida gama grass	*Tripsacum floridanum*	Rocky pine rocklands	Medium
E	Young-palm orchid	*Tropidia polystachya*	Hammocks	Medium
E	Worm-vine orchid	*Vanilla barbellata*	Mangroves, coastalhammocks, rocky pinelands, island hammocks in the Everglades	Medium
E	Leafy vanilla	*Vanilla phaeantha*	Cypress swamps	Low
E	Biscayne prickly ash	*Zanthoxylumcoriaceum*	Tropical coastalhammocks	Low
T	Redmargin Zephyrlily	*Zephyranthes simpsonii*	wet pine flatwoods, meadows, pastures, roadsides, and glade borders	Medium

Sources: PPMP in Appendix D; FNAI, 2013; Natureserve, 2013; Wunderlin and Hansen, 2011; Leon Levy Native Plant Preserve, 2013;

TABLE H-3
State Listed Wildlife Species
HARB Integrated Natural Resources Management Plan

State Status	Common Name	Scientific Name	Habitat Type	Habitat Potential on HARB
Birds				
SSC	Limpkin	*Aramus guarauna*	Freshwater wetlands	High
SSC	Little blue heron	*Egretta caerulea*	Shallow freshwater, brackish, and saltwater habitats	High
SSC	Reddish egret	*Egretta rufescens*	Coastal strand and mangrove keys	High
SSC	Snowy egret	*Egretta thula*	Coastal and inland wetlands	High
SSC	Tricolored heron	*Egretta tricolor*	Mangrove Islands and freshwater willow thickets	High
SSC	White ibis	*Eudocimus albus*	Freshwater, brackish, and saline environments	High
T	Southeastern American kestrel	*Falco sparverius paulus*	Pine flatwoods	High
T	Florida sandhill crane	*Grus canadensis pratensis*	Pastures, prairies, and emergent wetlands	Low
SSC	American oystercatcher	*Haematopus palliates*	Coastal strand	Low
T	White-crowed pigeon	*Patagioenas leucocephala*	Primarily in mangrove forests	Low
SSC	Brown pelican	*Pelecanus occidentalis*	Near shore marine waters and coastalislands	Low
SSC	Roseate spoonbill	*Platalea ajaja*	Coastal strand, marshes, and sloughs	Low
SSC	Black skimmer	*Rynchops niger*	Estuaries and coaslines	Low
SSC	Florida burrowing owl	*Athene cunicularia floridana*	Grasslands and other open areas	High
T	Least tern	*Sterna antillarum*	Open, flat beach areas	High

TABLE H-3
State Listed Wildlife Species
HARB Integrated Natural Resources Management Plan

State Status	Common Name	Scientific Name	Habitat Type	Habitat Potential on HARB
Mammals				
T	Southern mink	*Neovison vison* pop. 1	Shallow wetlants and marshes	Low
SSC	Florida mouse	*Podomys floridanus*	Scrub and sandhill communities	Low
T	Florida black bear	*Ursus americanus floridanus*	Hardwood swamps and dense thickets	Low
Fish				
SSC	Mangrove rivulus	*Rivulus marmoratus*	Mangrove swamps and salt marsh areas	Low
Reptiles				
SSC	American alligator	*Alligator mississippiensis*	Primarily freshwater swamps and marshes	High
T	Gopher tortoise	*Gopherus polyphemus*	Xeric scrub oak, coastalstrand and dune, live oak hammocks, dry prairie, pine Flatwoods, and mixed hardwood-pine communities	Low
SSC	Florida pine snake	*Pituophis melanoleucus mugitus*	Habitats with open canopies and dry sandy soils, sand hills, pastures, sand pine scrub and scrubby flatwoods	Medium
T	Rim rock crowned snake	*Tantilla ooltica*	Pine flatwoods and tropical hammocks	Medium

Sources: FNAI, 2013

TABLE H-4
Invasive and Nonnative Species Found in the Survey Areas
HARB Integrated Natural Resources Management Plan

Scientific Name	Common Name	*State/Local Status* [1]	FL EPPC Cat. I/II [2]	AREAS 1	2	3	4	5	6	7	8	9	10	11
Albizia julibrissin	Mimosa		I	X	X		X	X						
Ardisia elliptica	Shoebutton Ardisia	N, MDP	I	X		X		X						
Brassaia actinophylla	Schefflera	MDP	I			X								
Casuarina equisetifolia	Australian pine	P, N, MDP	I	X	X	X	X	X		X		X		X
Cryptostegia sp.	Rubber vine		II	X				X						
Cuscuta gronovii	Dodder			X	X	X	X	X						
Cynodon dactylon	Bermuda grass			X	X	X	X	X	X					
Dactyloctenium aegyptium	Crowfoot grass		II	X			X	X						
Delonix regia	Royal poinciona			X	X	X		X						
Dioscorea bulbifera	Air potato	N, MDP	I											X
Guaiacum officinale	Lignum vitae			X										
Lantana camara	Shrub verbena		I	X	X	X	X	X	X					
Melaleuca quinquenervia	Melaleuca tree	P, N, U, MDP	I			X								
Neyraudia reynaudiana	Burma reed	N, MDP	I	X	X	X	X	X	X	X				X
Panicum repens	Torpedo grass	MDP	I	X					X					
Paspalum notatum	Bahia grass								X	X				
Pennisetum purpureum	Napier grass	MDP	I						X			X	X	

TABLE H-4
Invasive and Nonnative Species Found in the Survey Areas
HARB Integrated Natural Resources Management Plan

Scientific Name	Common Name	*State/Local Status* [1]	FL EPPC Cat. I/II [2]	AREAS 1	2	3	4	5	6	7	8	9	10	11
Ricinus communis	Castor bean	MDP	II			X		X						
Schinus terebinthifolius	Brazilian pepper	P, N, MDP	I	X	X	X	X	X				X	X	X
Seteria sp Tradescantia	Foxtail Oyster plant							X	X					
(Rhoeo) spathacea	(Boatlilly)		II	X		X	X							
Wedelia (Sphagneticola)	Creeping oxeye*		II	X	X				X					

*Creeping ox-eye is a native invasive species.

Areas

(1) = Phantom Lake and the Old Grenade Range (2) = Operable Unit 2 (3) = Grenade Range and Reserves Area (4) = Remnant Pike Rockland (5) = Munitions Area (6) = Airfield (cleared areas within and proximal to the flightline surfaces) (7) = Twin Lakes Area (8) = Southwest Clear Zone (9) = Hush House Area (10) = Southern boundary canal between Twin Lakes and the Southeast Triangle (11) = Southeast Triangle

[1] **N** = Noxious weed as listed by the Florida Department of Agriculture & Consumer Services **P**=Prohibited by Florida Department of Environmental Protection **U** = Listed as Noxious by the U.S. Department of Agriculture **MDC** = M iami-Dade County Controlled **MDP** = M iami-Dade County Prohibited

[2] Florida Exotic Pest Plant Council **(FLEPPC) Category I** = Species that are invading and disrupting native plant communities in Florida. This definition does not rely on the economic severity or geographic range of the problem, but on the documented ecological damage caused. **Category II** = Species that have shown a potential to disrupt native plant communities. These species might become ranked as Category I, but have not yet demonstrated disruption of natural Florida communities.

Source: e2M, Inc, 2005

TABLE H-5
Fish and Reptile Species Observed by e²M on HARB
HARB Integrated Natural Resources Management Plan

Scientific Name	**Common Name**	***Areas Observed on HARB***	**Approximate# of Indi vi duals Observe d**
Alectis ciliaris/Lepomis macrochirus	Sunfish/ Blue Gill	Boundary Canal and Storm Water Reservoir	200
Centropomus undecimalis	Common Snook	Boundary Canal West of Grenade Range and Reserves Area; Boundary Canal in the Hush House Area	<5
Cichlasoma urophthalmus	Mayan Cichlid	Boundary Canal and East Flight Line Canal	75
Cichlid spp.	Unidentified Cichlid spp.	Boundary Canal	10
Clarias batrachus	Walking catfish	Boundary Canal	1
Lepisosteus platyrhincus	Florida Gar	Boundary Canal	25
Megalops atlanticus	Tarpon	Boundary Canal NE Segment DD, East Flight Line Canal	5
Micropterus salmoides and M.s. floridanus	Black Bass	Boundary Canals, East Flight Line Canal, Stormwater Reservoir	550
Monopterus albus	Asian Swamp Eel	Perimeter Canal	1
Mugil cephalus	Striped Mullet	Boundary Canal	80
Oreochromis aureus	Blue Tilapia	Boundary Canal, East Flight Line Canal, and Stormwater Reservoir	100
Oreochromis mossambicus	Mozambique Tilapia	Boundary Canal in the Old Grenade Range Area	<5
Pterygoplichthys multiradiatus	Sailfin Catfish	Boundary Canal	5
Tilapia mariae	Spotted Tilapia	Boundary Canal, Phantom Lake, and Stormwater Reservoir	675

TABLE H-5
Fish and Reptile Species Observed by e^{2}M on HARB
HARB Integrated Natural Resources Management Plan

Scientific Name	**Common Name**	***Areas Observed on HARB***	**Approximate# of Indi vi duals Observe d**
Alligator missippissiensis	American Alligator	Southwest Clear Zone, East Flight Line, Boundary Canals House Area	5
Basiliscus basiliscus	Dragon (Jesus) Lizard	Boundary Canal in the Old Grenade Range Area	1
Caiman crocodilus	Spectacled Caiman	Boundary Canal, East Flight Line, and Phantom Lake	50
Chelydra serpentine	Snapper Turtle	Boundary Canal in the Old Grenade Range Area	1
Chrysemys picta	Painted Turtle	Boundary Canal in the Old Grenade Range Area	1
Iguana iguana	Green Iguana	Boundary Canal NE Segment LV and Stormwater Reservoir	<5
Trachemys scripta	Slider Turtle	Boundary Canals	20

Source: e2M, Inc, 2005; Gandy and Rehage, 2013