Draft

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

Volume II

July 2009

Prepared for:

United States Department of the Air Force
Headquarters, Air Force Reserve
Environmental Division
Robbins Air Force Base, Georgia 31098-1635

A HARB Projects

Appendix A provides a detailed description of the projects planned for implementation by HARB over the next five years. Table A-1 provides a summary listing of each project. Table A-2 shows project costs by funding year. Each project presented in Appendix A also is addressed in Section 4, Goals, Objectives, and Strategies. Project monitoring procedures are established in Section 4.2.

Implementation of the projects discussed in this section is largely dependent upon availability of funds. *Air Force Conservation and Programming and Budgeting Guidance,* issued on 11 September 2000, outlines appropriate funding sources, funding priorities, and levels of effort for Air Force conservation programs (AFI 32-7064, 17 December 2004). HARB will use operations and maintenance (O&M) funds for funding the projects listed in Table A-1 and discussed in this section. For the purpose of deciding funding priorities, projects are classified as Level 0, 1, 2, or 3.

- Level 0 - Recurring on an annual or more frequent basis that are "must do" activities, such as projects necessary to execute the compliance obligations of the AF Conservation Program or activities which are in direct support of the military mission.
- Level 1 - Non-recurring requirements, occurring only once or less frequently than once a year, that corrects an out-of-compliance condition with a valid driver in the year programmed.
- Level 2 - Non-recurring funding requirement for activities and projects programmed in a fiscal year that is in advance of the year in which compliance is mandatory.
- Level 3 - Non-recurring activities and projects that are not explicitly required by an applicable legal driver, but are need to enhance the environment beyond statutory compliance.

Table A-1

Project Summary Table

Project No.	Project Description	INRMP Page Ref.	Programmed Fiscal Year (FY)	Fund Source	Fund Type	Project Estimate	Driver	Level
1	Updated Wetland Identification Report and Management Component Plan	A-4 2	011	ENV	O&M	$40,000	4,5,6	2
2	Infield/Airfield Wetlands Removal Feasibility Study	A-5 2	009	ENV	O&M	30,000	4,5,6	1
3	Landscape Management Plan	A-6	2010	ENV	O&M	Internal	1,2,3,7,8	2
4	Updated Invasive and Exotic Species Management Plan (IESMP)	A-7 2	009	ENV	O&M	30,000	2,3,4,5,6	1
5	HARB Pine Rockland Restoration and Management Plan (PRRMP)	A-8 2	011	ENV	O&M	$30,000	2,3	3
6	Phantom Lake and Old Grenade Range Improvements and Constraints Evaluation	A-9 2	012	ENV	O&M	$30,000	2,3	3
7	Twin Lakes Feasibility Study	A-10	2012	ENV	O&M	$30,000	2,3,7,8	3
8	Boundary Canal Fish Population Study	A-11	2012	ENV	O&M	$50,000	-	3
9	Base Caiman Removal/Control Feasibility Study	A-12 2	011	ENV	O&M	$30,000	3	1
10	Develop an Ecosystem Management Training/Education Program	A-13 2	011	ENV	O&M	Internal	-	3

ENV = Environmental + O&M = Funds

O & M (Operations and Maintenance) Funding Priorities

Level 0 = Recurring on an annual or more frequent basis that are "must do" activities.

Level 1 = Non-recurring requirements, occurring only once or less frequently than once a year, that corrects an out-of-compliance condition.

Level 2 = Non-recurring funding requirement for activities and projects programmed in a fiscal year which is in advance of the year in which compliance is mandatory.

Level 3 = Non-recurring activities and projects that are not explicitly required by an applicable legal driver, but are need to enhance the environment beyond statutory compliance.

Primary Drivers

1 = EO 13148 Greening the Government through Environmental Management

2 = USC 2814 Management of Undesirable Plants of Federal Lands

3 = EO 13112 Invasive Species, February 3, 1999,

4 = AFI-91-202, the Air Force Mishap Prevention Program

5 = AFPM 91-212, BASH Management Techniques

6 = Unified Facilities Criteria, Airfield and Heliport Planning and Design, UFC 3-260-01

7 = AFI 32-7064, Integrated Natural Resources Management (September, 2004)

8 = EO 12902, Energy Efficiency and Water Conservation at Federal Facilities, 8 March 1994

Table A-2

HARB INRMP Projects Costs by Fiscal Year (FY)

Project #	2009 2	010	2011	2012	2013	Total
1	--	--	$40,000	--	--	$40,000
2	$30,000	--	--	--		$30,000
3	--	N/A	--	--		Internal
4	$30,000	--	--	--		$30,000
5	--	--	$30,000	--		$30,000
6 --		--	--	$30,000	--	$30,000
7 --		--	--	$30,000	--	$30,000
8 --		--	--	$50,000	--	$50,000
9	--	--	$30,000	--		$30,000
10	--	--	N/A	--		Internal
TOTAL	**$60,000**	**$00**	**$100,000**	**$110,000**	--	**$270,000**

Project No. 1: Update Wetland identification Report and Management Component Plan

Cost: $40,000.

Purpose: To update the location and extent of jurisdiction wetlands on base.

Location: Airfield Area (see Figure 2-2).

Description: The open and undeveloped areas to the southeast of the runway and within the infield of HARB have a number of acres of jurisdictional wetlands. The subject wetlands located on HARB, including the ones south of the runway, play an important role in handling storm water runoff, promoting infiltration and ground water recharge, and water quality improvement.

The last detailed jurisdictional wetland delineation study was performed in the early 2000s as part of the 2004 INRMP. No follow-up delineation study has been performed since that time. In addition, the earlier study made use of a wetland identification process (WRAP) that has since been superseded by State of Florida guidelines.

The evaluation will address airfield safety requirements including the requirements of *Unified Facilities Criteria 3-260-01, Airfield and Heliport Planning and Design,* AFI 91-202, *The US Air Force Mishap Prevention Program*, and HQ 482nd FW Bird-Aircraft Strike Hazard Reduction Program, Plan 91-212.

Baseline conditions and monitoring procedures will be identified as a result of the study.

Assessment Level: Level 2.

Funding Source: Environmental.

Driver: AFPM 91-212, *BASH Management Techniques*
Unified Facilities Criteria 3-260-01, *Airfield and Heliport Planning and Design*

Project No. 2: Infield/Airfield Wetlands Removal Feasibility Study

Cost: $30,000.

Purpose: To evaluate the removal and/or modification of wetland areas within the infield and southeast of the runway to improve airfield drainage and support safe flight operations.

Location: Airfield area (see Figure 2-2).

Description: The presence of infield wetlands and the wetlands south of the runway creates operational concerns on HARB for two primary reasons. First, is the operational concern of BASH associated with the wetlands. Migratory and resident birds use the wetland areas for foraging. Often crossing back-and-forth over the runway, the foraging birds are a significant BASH concern. In addition, HARB wetlands occur within the 1,000-foot clearance zone on either side of the runway. The *Unified Facilities Criteria 3-260-01, Airfield and Heliport Planning and Design,* identifies the need for a solid serviceable surface for this zone to establish a safe correction zone for aircraft during arrival and departure.

The focus of the study will be the removal/modification of wetlands for a reduction in bird activity in the vicinity of the airfield. It is likely that removal/modification of the infield wetlands to conditions offering less or no appeal as forage and cover would, to some degree, contribute to BASH reduction; however, the overall impact or cost of wetland removal/modification is not clear. Project 3 will be used to address issues that must be resolved before any final decision can be made. These issues include the effect wetland removal/modification would have on airfield drainage, including the management and displacement of surface water, infiltration reduction, and water quality impacts. Project 3 also will address the issues of wetland alteration for the stabilization of the primary surface of the runway for pilot and aircraft safety.

Baseline conditions and monitoring procedures will be identified as a result of the study.

Assessment Level: Level 1.

Funding Source: Environmental.

Driver: AFI 91-202, *The US Air Force Mishap Prevention Program*
AFPM 91-212, *BASH Management Techniques*
Unified Facilities Criteria 3-260-01, *Airfield and Heliport Planning and Design*

Project No. 3: Landscape Management Plan

Cost: Internal.

Purpose: To prepare a landscape management plan for HARB to reduce grounds maintenance costs and introduce plants native to the South Florida region.

Location: HARB.

Description: 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 the implementation of environmentally beneficial landscaping.

AFI 32-7064 (17 SEP 2004) – *Integrated Natural Resources Management, Chapter 11, Land Management,* requires landscape design and maintenance activities to comply with the goals of the INRMP. Section 4, Objective 1.2 establishes the need for HARB to use regionally native plants, avoid invasive and exotic species, reduce chemical use, minimize effects on natural habitats, and reduce maintenance. These landscaping practices will be achieved on HARB through the development and implementation of the Landscape Management Plan.

A principle 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 overall benefit to the environment.

Baseline conditions and monitoring procedures will be established in the plan.

Assessment Level: Level 2.

Funding Source: Environmental.

Driver: EO 13148, *Green the Government through Leadership in Environmental Management*
USC 2814, *Management of Undesirable Plants of Federal Lands*
EO 13112, *Invasive Species*
Draft AFI 32-7064, *Integrated Natural Resources Management*
EO 12902, *Energy Efficiency and Water Conservation at Federal Facilities*

Project No. 4: Updated Invasive and Exotic Species Management Plan (IESMP)

Cost: $30,000.

Purpose: To prepare and implement an Updated IESMP for the eradication/control of invasive and exotic plant species.

Location: HARB.

Description: 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 what native communities remain on HARB, the invasive and exotic species problem contributes to increase flooding and is a potential fire hazard.

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. Species 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 species and (2) take into account emerging invasive and exotic species management initiatives outside the boundaries of HARB.

Baseline conditions and monitoring procedures will be established in the plan.

Assessment Level: Level 1.

Funding Source: Environmental.

Driver: USC 2814 *Management of Undesirable Plants of Federal Lands*
EO 13112, *Invasive Species*
AFI-91-202, *The Air Force Mishap Prevention Program*
AFPM 91-212, *BASH Management Techniques*

Project No. 5 HARB Pine Rockland Restoration and Management Plan (PRRMP)

Cost: $30,000.

Purpose: To prepare a plan to enhance habitat quality and increase wildlife diversity of the HARB Pine Rockland community.

Location: Remnant Pine Rockland area (see Figure 2-2).

Description: A remnant pine rockland community (approximately 5 acres) is located in the northwest corner of the Base. Hurricane Andrew struck the area in 1992 resulting in immediate and long-term damage to this community. This remnant community on HARB represents an excellent opportunity to re-establish a productive remnant pine rockland community. Unique to south Florida, a restored pine rockland community may contain a diverse array of rare or listed plant and animal species. Restoration efforts for this area will support and enhance the regional efforts undertaken by Miami-Dade County and would help preserve the small amount of pine rockland habitat that remains of its former range.

This project is to prepare a site-specific restoration plan to enhance habitat quality and increase wildlife diversity of the pine rockland community. This first step would be developed with input by Miami-Dade County DERM and other groups that are involved in pine rockland restoration. The plan would outline the restoration processes, which would involve aggressive efforts to remove exotic and hardwood species (to occur over approximately 3 to 5 years), then continual maintenance once maintenance conditions are established (generally considered to be 5% or less exotic coverage). At this point, state-listed plant species that are in precarious habitat conditions on other parts of the Base could be transplanted to this conservation site. Manual and mechanical techniques for removal of exotic plant species and maintenance of the proper succession forest species assemblage on the 5-acre tract would likely be required given the constraints on use of fire in proximity to the Base's fuel tank farm.

Baseline conditions and monitoring procedures will be established in the plan.

Assessment Level: Level 3.

Funding Source: Environmental.

Driver: None.

Project No. 6: Phantom Lake and Old Grenade Range Improvements and Constraints Evaluation

Cost: $30,000.

Purpose: To evaluate the potential for the Phantom Lake and Old Grenade range areas to support native communities.

Location: Phantom Lake area and Old Grenade Range (see Figure 2-2).

Description: The Phantom Lake upland is dominated by invasive exotic species, although the area continues to harbor a variety of native trees and plants, including several state-listed plant species. Although the area has favorable conditions for natural resources-based recreation, the current ESCZ arc represents a constraint in its current configuration. Invasive exotic species are pressuring native communities that include state-listed plants, and presently diminish the quality of the area for recreational values. Recent MMRP studies at the Old Grenade Range demonstrated the existence of state-listed pine rockland species are present within the interior.

HARB is interested in exploring the potential for Phantom Lake and its surrounding upland area to provide an area to enhance habitat conditions for native communities. While it is feasible for HARB to undertake habitat improvements for the area, Project 6 will be used to address issues that must be resolved before any final decisions can be made. These issues include:

- Site security concerns;
- Requirements for roadway access into the site;
- Safety restrictions of the ESCZ arcs affecting the use of the site;
- Wildland fire management concerns,; and
- An estimate of capital improvement and O&M funding (and prioritizing of that funding) requirements for habitat restoration and maintenance.

Baseline conditions and monitoring procedures will be identified as a result of the evaluation.

Assessment Level: Level 3.

Funding Source: Environmental.

Driver: None.

Project No. 7: Twin Lakes Feasibility Study

Cost: $30,000.

Purpose: To evaluate the potential for the Twin Lakes area to support native communities.

Location: Twin Lakes area (see Figure 2-2).

Description: The Twin Lakes area is southeast of the runway (see Figure 2-2). The Twin Lakes area consists of two deepwater borrow lakes with an emergent wetland fringe composed primarily of cattails and sawgrass. The entire area is delineated as jurisdictional wetland. Given the lakes and semi-natural conditions in the parcel, it has the potential for providing some natural resource benefits for HARB; however, because of the proximity of this acreage to the airfield, the possibility that natural resources management decisions/methods may affect BASH potential is a primary concern.

HARB is interested in exploring the possibility of enhancing natural communities through the control of invasive exotic species in the vicinity of the Twin Lakes. Toward this end, Project 7 will be used to examine whether these improvements would be compatible with various operational factors, such as:

- Access, security and safety aspects for providing recreational fishing in these lakes (that are located between the airfield and property fence line);
- The airfield storm water drainage system function and performance;
- Airfield primary and transitional zone clearance requirements; and
- BASH plan objectives for reducing potential for bird strikes.

Baseline conditions and monitoring procedures will be identified as a result of the study.

Assessment Level: Level 3.

Funding Source: Environmental.

Driver: None.

Project No. 8: Boundary Canal Fish Population Study

Cost: $50,000.

Purpose: To evaluate the distribution and populations of exotic and native fish species within the Boundary Canal, Phantom Lake, and the Twin Lakes to promote the existence and diversity of native fish communities at HARB.

Location: Boundary Canal (see Figure 2-2).

Description: Boundary Canal contains a number of exotic fish and wildlife species, including the spectacled caiman, cichlids, oscars, and tilapia, that are competing for resources with native species. The objective of this study will be consistent with the community's regional plans and programs by lessening the potential that HARB would inadvertently become a source of exotic fish species within the drainage system of South Miami-Dade County.

Major issues to be addressed within the population study include restoration of the native fish populations, and any potential increase to existing BASH conditions.

Baseline conditions and monitoring procedures will be identified as a result of the study.

Assessment Level: Level 3.

Funding Source: Environmental.

Driver: None.

Project No. 9: Base Caiman Removal/Control Feasibility Study

Cost: $30,000.

Purpose: To evaluate the feasibility of controlling/removing the spectacled caiman from the Base.

Location: HARB.

Description: The exotic spectacled caiman has been observed at various locations on HARB including the in-field wetlands, the Boundary Canal System, Phantom Lake, and the Twin Lakes area. As with other exotic species, the spectacled caiman is in direct competition with other native and non-native species for use of resources. At HARB, there is competition between the caiman and American alligator, and possibly the American crocodile. The removal/control of the spectacled caiman is expected to increase the availability of habitat for the American alligator and the American crocodile.

The feasibility study will evaluate the extent of population and feasibility of the removal/control of the spectacled caiman on the Base.

Baseline conditions and monitoring procedures will be identified as a result of the study.

Assessment Level: Level 1.

Funding Source: Environmental.

Driver: None.

Project No. 10: Develop an Ecosystem Management Training/Education Program

Cost: Internal.

Purpose: To ensure professional expertise and knowledge is kept current with science-based natural resources technology and research, and natural resources-related regulations and issues.

Location: HARB.

Description: Training is required for the following programs:

- Wetlands management;
- Surface Water Protection;
- Endangered Lands Management (Remnant Pine Rockland);
- Ecosystem Management (including invasive species control);
- Natural Resources Legal Requirements; and
- Pest Management.

Assessment Level: Level 3.

Funding Source: Environmental.

Driver: SAIA, 16 U.S.C. 670a et seq.

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B Correspondence

C **BASH Plan**

482 FWI 91-212

482d Fighter Wing Bird/Wildlife Aircraft Strike Hazard (BASH) Reduction Program

7 Sep 06

07 Sep 2006

MEMORANDUM FOR (SEE DISTRIBUTION)

FROM: 482FW/SE
12720 Tuskegee Blvd, Bldg 180
HARB, FL 33039-1299

SUBJECT: 482 FWI 91-212, Bird Aircraft Strike Hazard (BASH) Reduction Program

1. Attached is the 482 FWI 91-212, BASH Reduction Program, providing guidance for bird strike hazard reduction in areas where flying operations are conducted.

2. This Instruction is effective upon receipt.

3. Tasked organizations will develop checklists, appendices, etc. as required to fulfill assigned responsibilities.

4. This Instruction will be reviewed annually and require on-site reviews every 36 months, as appropriate, by tasked organizations.

5. The office of primary responsibility (OPR) for coordinating this Instruction is Major Joseph P. Feheley, 482 FW Chief of Safety.

>>>>SIGNED<<<<

RANDALL G. FALCON, Col, USAFR
482 Fighter Wing Commander

Attachment
482 FWI 91-212

SECURITY INSTRUCTIONS/RECORD OF CHANGES/ANNUAL REVIEW

1. The long title of the Instruction is 482FW Fighter Wing Bird/Wildlife Aircraft Strike Hazard (BASH) Reduction Program. The short title is 482 FWI 91-212.

2. The document is unclassified. In order to maintain good OPSEC practices, details of the Instruction should be distributed to those with a need to know.

3. Reproduction of this document in whole or part is authorized to prepare supporting Instructions or documents.

Record of Changes

Change Number	Date	Date Posted	Posted By
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Record of Annual Review

Reviewed By		Date Reviewed	Remarks
_____	_____		_____
_____	_____		_____
_____	_____		_____
_____	_____		_____

INSTRUCTION SUMMARY

1.1 PURPOSE: To provide 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).

1.2 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.

1.3 OPERATIONS TO BE CONDUCTED:

1.3.1 Specific Operations Include:

1.3.1.1 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.

1.3.1.2 Provisions to disseminate information to all assigned and transient pilots for specific bird hazards, and procedures to minimize exposure.

1.3.1.3 Procedures to eliminate or reduce environmental conditions that attract birds to the airfield and Miami-Dade County Landfill (M-DCLF).

1.3.1.4 Procedures to disperse birds on the airfield and the M-DCLF.

1.3.1.5 The sustainment of a Bird Hazard Working Group (BHWG).

1.4 Tasked Organizations: As listed in Chapter 2.

1.5 Supporting Plans: None required.

1.6 KEY ASSUMPTION: Bird activity poses a significant threat to aircraft flight operations.

1.7 TIME TO COMMENCE OPERATIONS: 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.

TABLE OF CONTENTS

CHAPTER 1, BASIC INSTRUCTION

REFERENCES: AFI 91-202, AFP 91-212,

TASKED ORGANIZATIONS: Reference Chapter 2

1.1 **General**. 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:

1.1.1 Establish procedures to identify high risk situations and to aid supervisors and pilots in altering/discontinuing flying operations when required.

1.1.2 Establish aircraft and airfield operating procedures to avoid high risk situations.

1.1.3 Help disseminate information to all assigned and transient pilots on bird hazards and procedures for bird avoidance.

1.1.4 Establish guidelines to decrease airfield attractiveness to birds.

1.1.5 Provide procedures for dispersing birds when they occur on the airfield or at the Miami-Dade County Land Fill (M-DCLF).

1.1.6 Sustain a Bird Hazard Working Group (BHWG) and designate responsibilities to its members.

1.1.7 Compile seasonal/yearly data to track bird concentration patterns to help make educated decisions regarding the flying schedule.

1.2 **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.

1.2.1 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.

1.3 **Low level routes.** 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.

1.4 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.

1.5 Execution:

1.5.1 Reducing the bird strike hazard at HARB requires a cooperative effort between several base organizations. The OPR for coordinating this Instruction is the Wing Safety Office.

1.5.2 Bird Hazard Working Group (BHWG):

1.5.2.1 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.

1.5.2.2 Authority. The BHWG submits all recommendations to the operational commander for approval. Implementation is through normal chain of command.

1.5.2.3 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.

1.5.2.4 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, the 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 Wing Safety office will meet weekly with the USDA 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 2, TASKED ORGANIZATIONS

2 **ORGANIZATION**

2.1 482FW/CV
2.2 482FW/OG
2.3 93FS/CC
2.4 482FW/SE
2.5 482 OG/OGV
2.6 482FW/SEF
2.7 482MSG/BCE/CE
2.8 482OSF/OSA/OSAA
2.9 482OG/SOF
2.10 482FW USDA Biologist
2.11 482OSF/OSAT
2.12 Tenants Det 1, 125FW/CC and Miami Air and Marine Branch/CC
2.13 Avon Park Range

CHAPTER 3, TASKS AND RESPONSIBILITIES

3.1 **Vice Wing Commander:**

3.1.1 Chairs BHWG meetings.

3.1.2 Approves recommendations of BHWG.

3.2 **Operations Group Commander**

3.2.1 Oversees the Supervisor of Flying Program which in turn declares, disseminates, and terminates bird watch conditions at HARB and the local training areas.

3.2.2 Issues specific procedural guidance for pilots and the Supervisor of Flying (SOF) for each bird watch condition.

3.2.3 Authority for granting or denying permission for any flying activity that is outside the normally approved procedures for a particular Bird Watch Condition.

3.2.4 Issues implementation procedures and actions required by the Command Post in support of this Instruction.

3.2.5 Makes operational changes to avoid areas and times of known hazardous bird concentrations, mission permitting. Considers the following during periods of increased bird activity:

3.2.5.1. Raising pattern altitude.
3.2.5.2. Changing pattern direction.
3.2.5.3. Avoiding takeoffs/landings within 1 hour of dawn/dusk.
3.2.5.4. Limiting or prohibiting formation takeoffs and landing.
3.2.5.5. Utilizing trail departures with rejoin altitudes greater than 3000 feet AGL.
3.2.5.6. Rescheduling local training to different areas.
3.2.5.7. Raising altitude en route to low-level or training areas.
3.2.5.8. Limiting time on low-level routes to the minimum training requirements.
3.2.5.9. 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).
3.2.5.10. Splitting formations during recovery.
3.2.5.12. Making full-stop landings.

3.3 **93d Fighter Squadron Commander:**

3.3.1 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.

3.4 **Chief, Wing Safety:**

3.4.1 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.

3.4.2 Reports on BASH issues and includes BHWG recommendations and actions in the agenda and minutes of the wing's quarterly ESOH Council meeting.

3.4.3 Plans and conducts the BHWG for the Chairperson. Disseminates BASH data to the BHWG.

3.4.4 Provides the BHWG with the current BASH guidance from HHQ, the BASH team, the USDA Fish and Wildlife Service, and other outside agencies. Additionally, presents Bird Hazard Condition trend data collected from the ATC tower and the USDA Biologist. This data is used by the BHWG to evaluate or modify operational procedures.

3.4.5 Supports and administers the USDA Wildlife Officer contract for the two USDA Wildlife biologists working at HARB.

3.4.6 Briefs pilots monthly on bird strikes affecting unit aircraft.

3.5 **Chief, Wing Standardization/Evaluation:**

3.5.1 Reviews, with Operations Group Commander, all proposed new low-level routes and training areas or changes to existing routes/areas for BASH potential.

3.5.2 Monitors flight briefings and debriefs to ensure bird strike avoidance is discussed when appropriate, and that Avon Park bird avoidance procedures are adhered to.

3.6 **Flying Safety Officer:**

3.6.1 Ensures pilots promptly report all bird strikes and hazardous conditions per this directive.
.
3.6.2 In the absence of the USDA Wildlife Biologist, logs all bird strikes affecting HARB aircraft in the AFSAS database.

3.6.3 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.

3.6.4 Ensure an adequate supply 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 93 FS Operations desk, or at

Maintenance debrief.

3.6.5 Briefs pilots on seasonal bird hazards, specifically during Phase II periods, contingencies and after-dark operations. Movies, articles, crosstells and other information will be used as appropriate to maintain awareness.

3.7 **Base Civil Engineer:**

3.7.1 Provides natural resources representation to the BHWG to monitor and advise the group of relevant environmental factors.

3.7.2 Develops procedures for removal or control of bird attractants.

3.7.3 Initiates surveys and writes environmental impact assessments and statements as required.

3.7.4 Corrects environmental conditions that increase BASH potential.

3.7.5 Uses land management practices that reduce BASH potential.

3.7.6 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.

3.7.7 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 interflock 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).

3.7.7.1 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.

3.7.7.2 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.

3.8 **Chief, Airfield Management:**

3.8.1 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.

3.8.2 The Chief of Airfield Management bases the declaration of a bird watch condition on:

3.8.2.1 Observations made by the USDA Wildlife Biologist call sign “Birdman”.

3.8.2.2 Information relayed by airborne aircraft or other HARB personnel, familiar with the BASH program, working on the airfield.

3.8.2.3 Observations made and relayed to base operations by HARB tower, End of Runway crews, and Transient Alert personnel.

3.8.3 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.

3.9 **Supervisor of Flying (SOF):**

3.9.1 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:

3.9.1.1 Observations made by the USDA Wildlife Biologist, call sign “Birdman”.

3.9.1.2 Information relayed by airborne aircraft.

3.9.1.3 Observations made, and relayed to base operations by HARB tower, End of Runway crews, and Transient Alert personnel.

3.9.2 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.

3.9.3 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.

3.10 **United States Department of Agriculture, Wildlife Services (USDA):**

The USDA Wildlife Biologist’s radio call sign is “Birdman.”

3.10.1 Birdman will 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.

3.10.2 The second USDA Wildlife Biologist contracted by HARB works at the Local Landfill located 2 NM North of the base. His job is to control bird populations at the landfill which directly affects the numbers of birds that migrate on a daily basis to HARB. He employs the same methods at the landfill as utilized around the airfield environment.

3.10.3 Birdman 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.

3.10.4 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.

3.10.5 Maintains a current bird activity map for HARB.

3.10.6 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 with the US Fish and Wildlife Service, Audubon Society, local ornithologists, and other agencies.

3.10.7 Compiles daily BWC data to help plan the flying activities at HARB.

3.10.8 Implements many various techniques for decreasing the bird threat to HARB aircraft.

3.10.8.1 Bioacoustics. Bioacoustics are 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.

3.10.8.2 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.

3.10.8.3 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.

3.10.8.4 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 Birdman for permits and direction in this area.

3.10.8.5 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.

3.10.9 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.

3.10.10 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.

3.10.11 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.

3.10.12 Tracks bird numbers to establish seasonal migration levels that affect the BASH program.

3.10.13 Works with the Flying Safety Officer logging all bird strikes in the Air Force, AFSAS database.

3.10.14 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.

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

3.10.15 Provide the Wing Safety office with a monthly written report on the bird activities and trends for HARB.

3.11 **Chief, Air Traffic Control:**

3.11.1 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/USDA Biologist (Birdman) as appropriate. During periods when HARB aircraft <u>are not</u> flying ATC has the authority to raise the BWC status, but not lower it without Airfield Management concurrence.

3.11.2 Issues bird watch advisories to pilots as required.

3.11.3 Provides “Birdman”/Airfield Management prompt access to the runway under bird watch condition MODERATE or SEVERE .

3.12 **Tenant Units:**

3.12.1. 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.

3.13 **Avon Park Range (R2901):**

3.13.1. 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 AUX Field and Bombing Ranges due to his proximity to the sites.

CHAPTER 4, WILDLIFE

REFERENCES: BASH Team Reports, AFP 91-212, bird field identification guides, and wildlife agency reports.

4.1. 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 USDA Wildlife Biologist has significantly reduced 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.

4.2.16. 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.

4.2.16.1. Rodents. These animals attract raptors. Control by maintaining a uniform turf at proper heights. Rodenticides may be used in some cases.

4.2.16.2. Alligators/Caiman. Large alligators and Caiman are often reported on the airfield. They usually occur after heavy rains. The USDA biologist will work with Pesky Critters the Miami-Dade contractor licensed to deal with large reptiles. No other HARB agency should attempt any type of handling.

4.2.16.3. 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. 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, *AF Bird Strike Report*. The AF Forms 853 will be logged into the AFSAS system by the Flight Safety Officer or the USDA Wildlife Biologist. 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 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:
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

CHAPTER 6, OPERATIONAL PROCEDURES:

6.1. This chapter establishes procedures to use for the immediate exchange of information between ground agencies and pilots concerning the existence and location of birds that could pose a hazard to flight safety and specific actions required for various BWCs.

6.2. Bird Watch Conditions (BWC): Use the following terminology for rapid communications to disseminate bird activity information and implement unit operational procedures. Give bird locations with the condition code.

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 HARB's USDA biologist. See section 3.8 and 3.9.

6.3.2.1. They can 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 FW/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 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:

- Call -sign
- Location/Altitude
- Time of sighting
- Type of bird (if known)
- Approximate number of birds
- 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 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 ETAC, TACP, or an 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 93FS. Base operations also ensures 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. 482FW Off-Station BWC Procedures for Transit of Civilian/Military Airfields That Do Not Report Bird Watch Conditions:

6.8.1. 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 NOTAMS, 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 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 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, 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 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.

CHAPTER 7, DISTRIBUTION

ADDRESSEE	NO. COPIES
HQ AFRC/SE, Robins AFB, GA 31098-6002	1
10AF/SE NAS JRB Ft Worth, TX 76127-6200	1
9AF/SE, Shaw AFB, SC 29152	1
BASH Team, HQ AFSA, KIRTLAND AFB, NM 87117	1
Det 1, 347OG, Avon Park, AF Range, FL 33825 -5000	1
482ND FIGHTER WING	
CC	1
CV	1
SE	20
PA	1
482ND OPERATIONS GROUP (OG)	
CC	1
OGV	1
OSA	1
OSAT	1
OSW	1
93FS/CC	3
482ND MISSION SUPPORT GROUP (MSG)	
CC	1
BCE	4
482ND MAINTEANCE GROUP (MG)	
CC	1
LGQ	1
MXS	1
AMXS	1
TENANT UNITS	
Det 1, 125FW	1
Miami Air and Marine Branch	1
USDA, Wildlife Services	1

Appendix D

Wetland Identification Report and Management Component Plan for the Integrated Natural Resources Management Plan

Homestead Air Reserve Base, Homestead, Florida

Executive Summary

ES.1 Type of Document

This document is a Wetlands Identification Report and Management Plan.

ES.2 Purpose of Document

The plan was originally developed for the United States Air Force Reserve Command (AFRC) as part of the 2004 revision of the Integrated Natural Resources Management Plan (INRMP) for Homestead Air Reserve Base (HARB; the "Base"). This document describes the extent of wetlands on HARB, and how those wetland areas were delineated. Additionally, discussions regarding the ecological and hydrological resources present and their functionality as a wetland system are included. Currently, these areas are managed as part of normal Base operations; however, given this information, it is expected that the HARB wetlands management program, and therefore by extension these wetlands, can be enhanced while still keeping true to the mission of the Base as a functional Air Reserve Base. This report includes recommendations for the management of wetlands on the Base.

ES.3 Structure of the Report

The report is divided into three parts. The first one describes the Wetland Delineation that was conducted at HARB, using the United States Army Corps of Engineer (USACE) jurisdictional delineation and the State of Florida delineation methods.

The State of Florida's delineation method is outlined in *The Florida Wetlands Delineation Manual* (Gilbert *et al.* 1995). This method was developed to aid in the delineation of Florida wetlands and in the use of Chapter 62-340, Florida Administrative Code (F.A.C.). Chapter 62-340 F.A.C. covers the Delineation of the Landward Extent of Wetlands and Surface Waters. The intent of this code is to delineate and identify wetlands according to the definition in subsection 373.019(17), Florida Statutes (F.S.).

The second part of this report describes the Wetlands Rapid Assessment Procedure (WRAP) conducted on HARB. The WRAP incorporates concepts from the United States Fish and Wildlife Service's (USFWS's) Habitat Evaluation Procedure and the South Florida Water Management District's (SFWMD's) Save Our Rivers Project Evaluation Rating Index, both of which utilize measurable variables to assess and assign value to ecological communities. Additionally, the procedure incorporates the basic wetlands delineation requirements of the USACE, the Florida Department of Environmental Protection (FDEP) and the SFWMD.

The final part of this report describes the management plan for the wetlands at HARB. Currently, the wetlands management on the Base undertaken by the United States Air Force (USAF) consists of measures to maintain the clear zones around the airfield and to control the potential for bird/wildlife aircraft strike hazard (BASH) incidents. Both of these objectives are meant to ensure the safety of flight crews and passengers, and prevent damage to aircraft. The goal is to ensure airfield safety while maintaining "no net loss" of wetlands.

ES.4 Recommendations of the Management Plan

New ideas are proposed in this plan that would enhance the ecology of the area while continuing to comply with clear zone and safety requirements for the airfield, as follows:

- Maintenance of wetlands areas to remove/control invasive exotic species;
- Modifications to the current management techniques (mowing/spraying) to make them more ecologically friendly;
- Improvement and increase in maintenance of culverts and canals throughout the area to optimize hydrological connections.
- Analysis of the current drainage patterns of the area to determine efficiency of the system and consider improvements for optimization of the wetlands as an ecological system.

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List of Acronyms and Abbreviations

%	percent
>	Greater than
ACC	Air Combat Command
AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
AFRC	Air Force Reserve Command
AFRPA	Air Force Real Property Agency
ARS	Air Reserve Squadron
BRAC	Base Realignment and Closure
BASH	bird-aircraft strike hazard
BCA	Base Conservation Agency
CEV	Chief of Environmental Flight
DBH	diameter at breast height
DERM	Department of Environmental Resources Management
E & E	Ecology and Environment, Inc.
EIS	Environmental Impact Statement
FAA	Federal Aviation Administration
F.A.C.	Florida Administrative Code
F.S.	Florida Statute
Fac	Facultative
FacUp	Facultative up
FacWet	Facultative wet
FANG	Florida Air National Guard
FDEP	Florida Department of Environmental Protection

List of Acronyms and Abbreviations, continued

FEMA	Federal Emergency Management Agency
FDOT	Florida Department of Transportation
FIRM	Flood Insurance Rate Maps
FLUCCS	Florida Land Use, Cover and Forms Classification System
FW	Fighter Wing
GIS	Geographic Information Systems
GPS	Global Positioning System
Homestead AFBCA	Homestead Air Force Base Conversion Agency
HARB	Homestead Air Reserve Base
HARS	Homestead Air Reserve Station
INRMP	Integrated Natural Resources Management Plan
Obl	Obligate
PSA	Professional Services Agreement
ROD	record of decision
SAC	Strategic Air Command
SFWMD	South Florida Water Management District
SROD	supplemental record of decision
TAC	Tactical Air Command
TFW	Tactical Fighter Wing
U.S.C.	United States Code
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USARC	United States Air Reserve Command
USCS	United States Customs Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WMD	water management district
WRAP	Wetlands Rapid Assessment Procedure

1 Introduction

This Wetland Identification Report and Management Component Plan was developed for the United States Air Force Reserve Command (AFRC) as part of the revised 2004 Integrated Natural Resources Management Plan (INRMP) for Homestead Air Reserve Base (HARB; also referred to herein as the Base), Florida. This document describes the extent of wetlands on HARB, and the delineation of those wetlands. Additionally, this document discusses the ecological and hydrological resources of wetlands present on HARB and their functionality as a wetland system. Currently, these areas are being managed as part of normal Base operations. However, given this information, it is expected that the HARB wetlands management program, and therefore by extension these wetlands, can be enhanced while still keeping true to the mission of the Base as a functional Air Reserve Base. This report includes recommendations for management of wetlands on the Base.

1.1 Site Description/History

HARB is a 1,937-acre installation located within the southern portion of Miami-Dade County (formerly Dade County; see Figure 1-1). The Base is located near the southern tip of the Florida peninsula, about 20 miles south-southwest of the city of Miami, 4 miles northeast of the city of Homestead, and approximately 1.5 miles inland from Biscayne Bay and the Atlantic Ocean. The regional community is defined by the city of Miami to the north, the Homestead-Florida City areas to the west and southwest, Biscayne National Park to the east, and Everglades National Park to the west.

Pan American Air Ferries, Inc. originally operated what is present-day HARB as a commercial airfield. After the United States entered World War II, the property was deeded to the federal government; Homestead Army Air Field was activated in September 1942 and remained in operation until September 1945, when a severe hurricane caused extensive damage to most of the airfield's facilities. 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 eight years, during

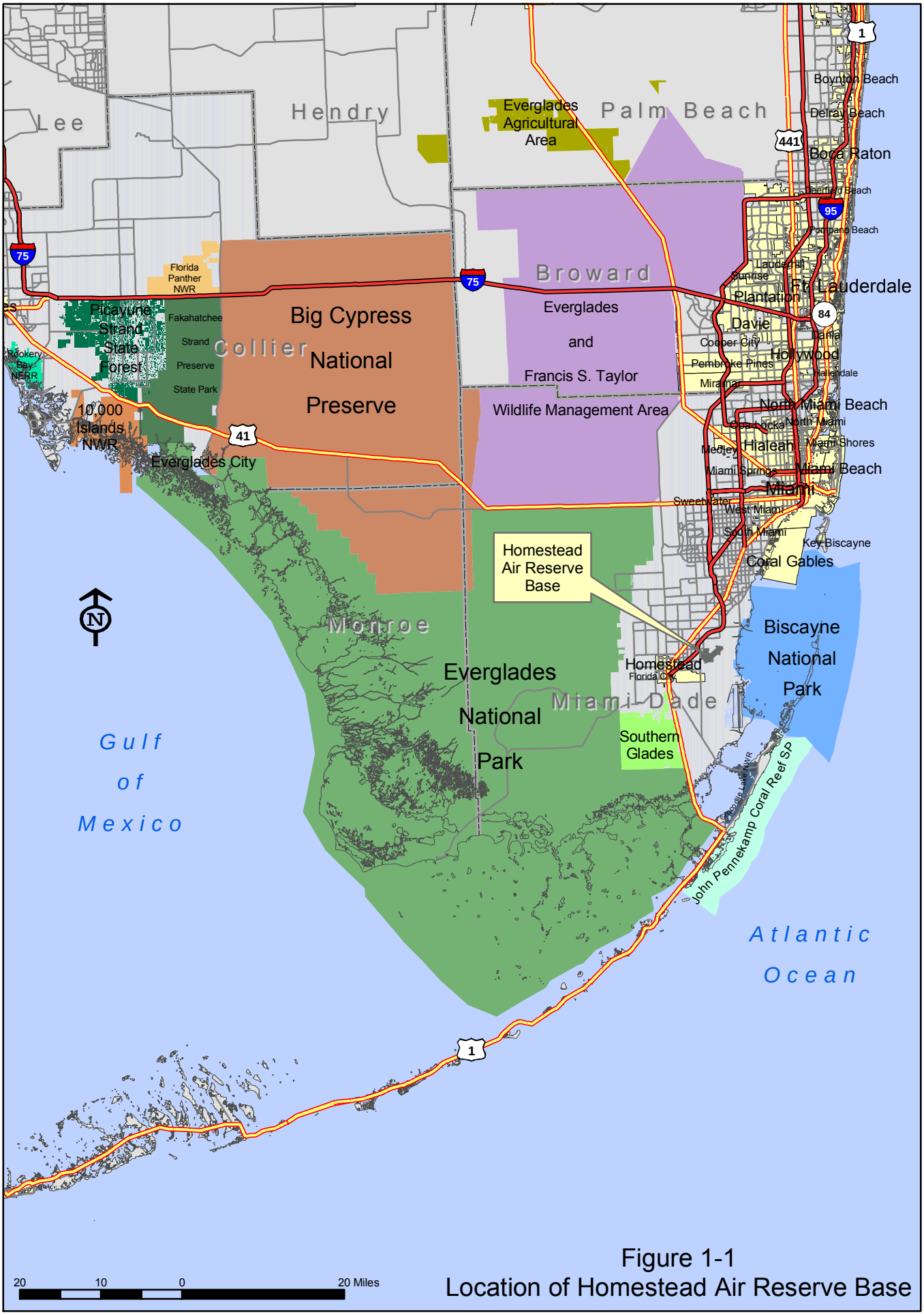


Figure 1-1
Location of Homestead Air Reserve Base

Source: Florida Natural Areas Inventory, 2002; Environmental Systems Research Institute, 2002.

which crop dusters used the runways, and the buildings housed a few small industrial and commercial operations (Air Force Reserve Command [AFRC], 1996).

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 Army Air Field 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. In October 1962, the Cuban Missile Crisis occurred resulting in the recognized need for an operational tactical air force presence in southern 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; AFRC 1996).

In 1992, Hurricane Andrew struck South Florida and caused extensive damage to Homestead AFB, which totaled approximately 2,838 acres at that time. 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 Homestead AFB were excess to its needs and surplus to the needs of the federal government, so later that year the Air Force Real Property Agency (AFRPA; formerly Homestead Air Force Base Conversion Agency [AFBCA]) began operating from the Base to manage the disposal of the land declared excess and surplus. The AFRPA mission included the remediation of sites at the Base that were contaminated by petroleum products and derivatives (Air Force Base Conversion Agency [AFBCA], 2002). The AFRPA 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, Florida, for use as a public airport. The AFRC planned to use the remainder of the property and designated it the Homestead Air Reserve Station (HARS; United States Air Force and Federal Aviation Administration [USAF and FAA], 2001).

In December 1997, the USAF and the Federal Aviation Administration (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 second 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 second SROD, the USAF would transfer the remaining surplus property (717 acres) to Miami-Dade County for mixed-used development. The USAF retained about 915 acres, including the airfield (USAF and FAA, 2001).

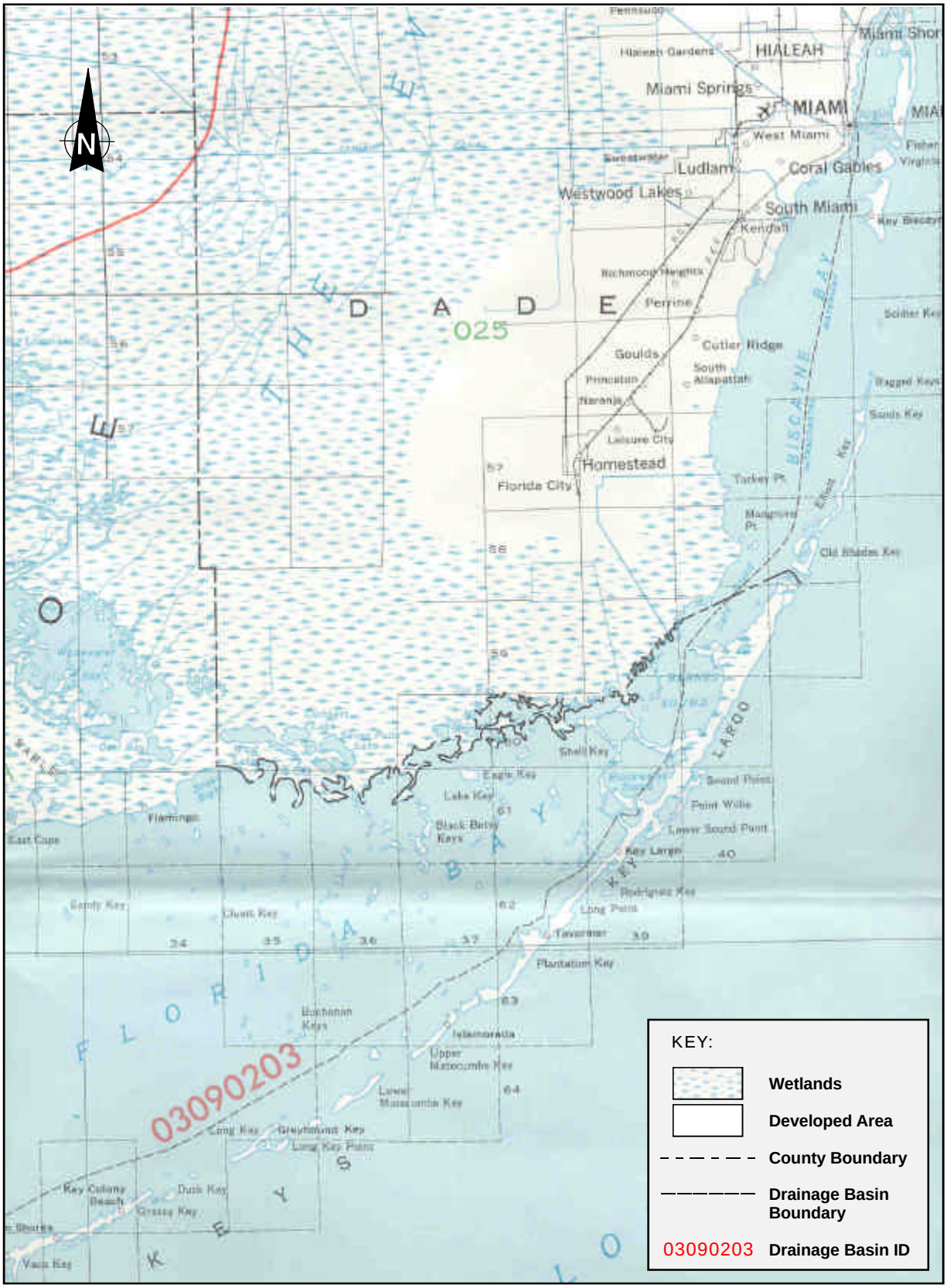
As a result of the second SROD, the USAF approved (in 2002) Miami-Dade County's mixed-use redevelopment, non-aviation land redevelopment plan, and the county's application for Economic Development Conveyance on 614 acres (AFBCA, 2002). An additional 26 acres will be given to the United States Department of Education for transfer via a Public Benefit Conveyance to Miami-Dade County Public Schools (AFBCA, 2002). The 482nd Fighter Wing (FW) will assume ownership of approximately 915 acres of land, including the airfield, runway, airfield apron, control tower, and Boundary Canal. The Outfall and Military Canal also likely will be transferred to the 482nd FW after the AFRPA completes remedial actions (AFBCA, 2002).

1.2 South Florida Wetlands

The wetlands of South Florida are primarily marshes that are best described as low-lying wet areas dominated by herbaceous plants. The largest area of marsh in South Florida is the Everglades, which is fed by sheet flow (surface water) flowing southward from the northern portion of the peninsula. Many of the non-Everglades wetlands found in South Florida are either hydrologically connected to the Everglades or are fed by rainwater. Peat deposits may become very thick in these marsh areas, with the dominant vegetation consisting of sawgrass and cattails. Much of the wildlife of south Florida depends on these wetland habitats for at least a portion of, if not their entire, life cycle. South Florida ecosystems are also very unique due to the subtropical to tropical climate and the geographic isolation of the area from other areas of similar climate. Historically, marshes covered much of South Florida; however, much of the topography has been impacted by human activities, most notably, urban development.

1.3 Wetland Delineation

A wetland delineation was performed within the extent of HARB as part of the fieldwork in support of the Integrated Natural Resource Management Plan (INRMP) and this document. The methodologies involved in the delineation are discussed in more detail in Section 2 of this report. A wetland delineation is the designation of the extent of a wetland area through detailed identification of the plants, soils, and hydrology of the area (see Figure 1-2). What qualifies as a wetland can vary



SOURCE: Hydrologic Unit Map, State of Florida (USGS).

Figure 1-2 HYDROLOGIC UNIT MAP OF HOMESTEAD AFB, FLORIDA

depending upon which methodology is utilized for performing the designation. Different methods, while being very similar in scope, do contain differences in specific criterion. Generally speaking, a wetland may be most easily defined as an area in which the soils are saturated during most of the growing season. Two of the different methods for delineating wetlands that are relevant to the HARB property are the United States Army Corps of Engineers (USACE) method described in *Corps of Engineers Wetlands Delineation Manual* (USACE 1987) and the Florida Department of Environmental Protection (FDEP) method addressed in Chapter 62-340, Florida Administrative Code (F.A.C). The primary purpose behind performing a wetlands delineation is so that the various governing bodies for an area can regulate it based upon the laws pertaining to the protection of wetlands.

1.4 Wetland Rapid Assessment Procedure

A Wetland Rapid Assessment Procedure (WRAP) was also performed as part of the fieldwork on HARB and is detailed in Section 4. The WRAP is the state's methodology developed by the South Florida Water Management District (SFWMD) and is used by the USACE for determining impacts to jurisdictional wetlands. A new statewide wetland assessment methodology has been proposed by FDEP that, once adopted by rule, would be binding to FDEP, water management districts, local governments, and other governmental entities during their evaluations of wetlands and determination of mitigation for impacts (Florida Department of Environmental Protection [FDEP], 2002a).

The WRAP is used to assess wetland ecological communities that take into account the overall quality of the ecosystem being evaluated through a process of rating several predefined variables. The variables include such review items as wildlife habitat, predominant species of flora and fauna, adjacent land uses (current and historical), among other criteria, to give the user a way to quantify the overall functional value of the ecosystem. The WRAP is not intended as a means to compare different wetland communities to one another, but instead, as a technique to rate each separate ecosystem according to its own attributes and characteristics.

1.5 Wetlands Management

When referring to wetlands management in regard to HARB, two issues are paramount. The first is to allow for uninterrupted, safe flight operation on a year-round basis. The second is the proposed management of the wetlands for the purpose of controlling human impacts and exotic

species for the enhancement of water quality. Therefore, managing the wetlands includes wetlands alteration and protection.

While it is recognized that the HARB is located within an area that historically contained large acres of wetlands, it is also important to note that the main function of the wetland areas on the Base are for storm water drainage, retention, and treatment. Many wetland areas in South Florida have been invaded by exotic species, and the wetlands at HARB are no exception. Control of the vegetation within these areas could greatly increase the functionality of the wetlands. Management recommendations are discussed in more detail in Section 5.

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2 Wetlands Delineation

2.1 USACE Jurisdictional Delineation

Jurisdictional wetlands are considered "waters of the United States" and per the Clean Water Act (33 United States Code [U.S.C.] 1344), their chemical, physical, and biological integrity must be maintained. The USACE is the agency that oversees the delineation and protection of these areas. Any alteration of these jurisdictional areas (i.e., dredge and fill) must be reviewed and approved through a permitting process by the USACE. The delineation process is a very important first step in determining which areas fall within this level of regulation and protection. Additionally, establishing the boundaries of a wetland assists wetland scientists and managers in developing plans for proper management of that wetland.

2.1.1 Federal Methodology

For the wetland delineation on HARB the methodology outlined in the USACE's *Corps of Engineers Wetlands Delineation Manual* (USACE 1987) was used. This is the method the USACE uses to determine what areas are to be considered jurisdictional wetlands (i.e., within their jurisdiction as a regulatory authority). The method takes into account a combination of parameters so that a boundary can be formed and the jurisdictional wetlands may be mapped out.

The three parameters that are the determining factors of the USACE methodology are vegetation, hydrology, and soils. Under the vegetation parameter, an area must be dominated by greater than 50 percent (>50%) hydrophytic vegetation in order to be considered within a wetland. Hydrophytic vegetation is vegetation that has been known to grow in the anaerobic conditions of a wetland. There are different degrees of hydrophytic plants and these are taken into account when deciding upon the vegetation parameter:

- **Obligate** (Obl) plants must be in a wet area or they cannot survive at all.

- **Facultative** (Fac) plants may thrive in either wet areas or upland areas, but are generally found in one or the other.
- **Facultative wet** (FacWet) means the plant can live in either condition, but prefers wet areas.
- **Facultative up** (FacUp) means the plant can live in both conditions, but prefers upland areas.
- **Upland** means the plant does not exist and/or is not tolerant to wetland areas.

Obligate, facultative wet, and facultative may be considered hydrophytic, while facultative up and upland may not. The information relating to which category each plant species falls into may be obtained from the *National List of Plant Species that Occur in Wetlands: Southeast (Region 2)* (Biological Report 88(26.2), May 1988) prepared by the United States Fish and Wildlife Service (USFWS).

Hydrology is determined by a combination of field indicators and historical data. Field indicators such as watermarks, drift lines, sediment deposits, and inundation, among others, can be hard to identify in some areas, while in others they may be obvious. The wetlands on HARB had many field indicators to show wetland hydrology. Some sources of historical and recorded data include stream gauges, soil surveys, USACE district offices, United States Geological Survey (USGS), as well as state and local agencies.

The last parameter considered for wetland designation is the soil within the area. Hydric soils are soils that have been under anaerobic conditions for sufficient duration to develop hydric indicators; such as high organic content, gleyed or mottled soil conditions, and sulfidic odor. A narrow shovel, approximately 16 inches long, is normally used to collect a soil profile to check for hydric indicators; however, in shallow soils use of a soil probe may be easier. Soil information may be obtained from soil surveys prepared by the USGS, however, this information is broad-spectrum, and therefore, must not be relied upon solely without field data.

While conducting the fieldwork at HARB, numerous data points were considered to establish the boundary of the jurisdictional wetland. For each point, the three parameters described above were recorded on field sheets. These field sheets, as well as the new wetland maps and aerial photography, will be submitted to the USACE for their final approval. The field crew marked the boundary as it was determined in the field and a differential Global Positioning System (GPS) was utilized to allow for proper placement on various maps. The GPS used was the Trimble Pro XRS with submeter accuracy. The information collected by the GPS will be input into Geographic Information Systems (GIS) to create accurate maps that can be reproduced, as well as serve as a source of information for future database queries.

2.1.2 Federal Jurisdictional Extent and Location

The wetlands within HARB are primarily on the eastern side of the Base. One of the largest areas of wetland is near the "Hush House," south of the western end of the runway. The wetlands continue going northeast along the entire runway. These areas taper off along the eastern part of the runway. Expansive areas of wetlands also exist between the runway and taxiway, excluding the easternmost section. Another wetland area is located north of the western portion of the runway and west of the taxiway's end. In this area, two ditches drain runoff from the runway. The last area of wetland is just east of the Florida Air National Guard (FANG) and north of the eastern part of the runway. The total area of wetlands on HARB is 233.5 acres. Changes from the previous jurisdictional map were very minimal. In a few locations, the wetland areas expanded, possibly due to poor or altered drainage.

2.2 State of Florida Delineation

The State of Florida also has a delineation method, outlined in *The Florida Wetlands Delineation Manual* (Gilbert *et al*. 1995). This method was developed to aid in the delineation of Florida wetlands and in the use of Chapter 62-340, Florida Administrative Code (F.A.C.). Chapter 62-340 F.A.C. covers the *Delineation of the Landward Extent of Wetlands and Surface Waters*. The intent of this code is to delineate and identify wetlands according to the definition in subsection 373.019(17), Florida Statutes (F.S.):

> *"Wetlands" means those areas that are inundated or saturated by surface water or ground water at a frequency and a duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils. Soils present in wetlands generally are classified as hydric or alluvial, or possess characteristics that are associated with reducing soil conditions. The prevalent vegetation in wetlands generally consists of facultative or obligate hydrophytic macrophytes that are typically adapted to areas having soil conditions described above. These species, due to morphological, physiological, or reproductive adaptations, have the ability to grow, reproduce or persist in aquatic environments or anaerobic soil conditions. Florida wetlands generally include swamps, marshes, bayheads, bogs, cypress domes and strands, sloughs, wet prairies, riverine swamps and marshes, mangrove swamps and other similar areas. Florida wetlands generally do not include longleaf or slash pine flatwoods with an understory dominated by saw palmetto.*

2.2.1 State Methodology

Chapter 62-340, F.A.C was developed by the FDEP and the five water management districts (WMDs), with aid from the regulated public and environmental organizations, to provide a methodology that could be used consistently throughout the state of Florida. The focus of this

method is on the parameters of vegetation, hydric soil characteristics, and hydrologic indicators. The tools used in a delineation, per subsection 62-340.300(2), F.A.C., are vegetative index, hydric soil indicators, hydrologic indicators, and reasonable scientific judgment. Each tool can be very important in conducting a wetland delineation. The state of Florida method can vary from other delineation methods; however, it can also lead to the same conclusions as other methods depending upon the wetlands subject to the delineation process.

When using plants as an indicator for a wetland boundary, each plant species is placed into one of four categories: 1) obligate, 2) facultative wet, 3) facultative, or 4) upland. The vegetative index is a list of Florida plants, and the classification applied to each; only obligate, facultative wet, and facultative plants are on the vegetative index. All other plants are not listed and are considered to be upland. The definition of the classifications according to Chapter 62-340, F.A.C. are as follows:

- **Obligate**. Plant species which, under natural conditions, are only found or achieve their greatest abundance in an area which is subject to surface water inundation and/or soil saturation. Some obligate plant species can be observed in an upland, especially under a controlled environment. Included in this category are the littoral plants and emergent aquatics, such as *Nymphaea* spp. (water lilies), *Nelumbo* spp. (lotus), and *Nuphar lutem* (spatterdock).

- **Facultative Wet**. Plants which, under natural conditions, typically exhibit their maximum cover in areas subject to surface water inundation and/or soil saturation, but can also be found in an upland.

- **Facultative**. Plants which are so problematic in their distribution as to render them inappropriate for indicating inundation or soil saturation. Specifically included are exotic plants with a weedy distribution. Facultative plants are not used when evaluating the dominance of plant species or when determining the appropriate strata.

- **Upland**. Plants which, under natural conditions, cannot grow in areas of inundation and/or soil saturation. All plants not in the vegetative index are in this category.

The State method recognizes that in some situations, some plants go against the general rule of classification, requiring for the use of reasonable scientific judgment.

Plants can be classified into one of three different strata: canopy, subcanopy, or ground cover. Canopy is the top layer of a forest and includes any plant with a 4-inch or larger diameter at breast height (DBH). Subcanopy is any plant with a main stem of at least 4.5 feet in height and a DBH of 1 inch. Ground cover is any plant smaller than the subcanopy category. When using the vegetative index for wetland delineation, one stratum is applied to the entire area, using the canopy stratum as the starting point for classification. The stratum used to define the area must have a 10% cover for the community or higher.

A hydric soil is a soil that is saturated long enough during the growing season to develop anaerobic conditions in the upper part of the profile and favor the growth of hydrophytic vegetation. Sandy soils are saturated if the water table is within 6 inches of the surface, and a clayey or loamy soil is saturated if the water table is within 12 inches of the surface. The differences in depth between soil textures are due to capillary force, which can bring the water to the surface. Once anaerobic conditions continue in the upper part of the profile, organic matter can accumulate and reducing conditions can set in. These conditions can be observed in the field. The hydric soil indicators are:

- Muck;
- Mucky texture;
- Gley colors;
- Sulfidic odor;
- Dark surface;
- Organic accretions;
- Oxidized rhizospheres;
- Polychromatic matrix (matrix stripping);
- Stratified layers;
- Iron and Manganese concretions (for loamy and clayey textured soils only);
- Distinct or Prominent mottles (for loamy and clayey textured soils only); and
- Marl (for loamy and clayey textured soils only).

Complete descriptions of these indicators can be found in *Soil and Water Relationships of Florida's Ecological Communities* (Florida Soil Conservation Service 1992).

Because some field hydrologic indicators do not provide information on the normalcy of hydrologic events, reasonable scientific judgment and historic site information also must be applied. However, lack of hydrologic indicators should not be viewed negatively when other types of indicators are present. The following field indicators are listed within the rule:

- **Algal mats**. Presence or remains of nonvascular plant material that develops under inundation and persists after the water has receded.
- **Aquatic mosses or liverworts**. Bryophytes that grow on trees or substrates after prolonged inundation.

- **Aquatic plants**. Plants that float on water or require water for their entire structural support. They grow in areas of permanent, or nearly permanent, inundation. Aquatic plants are a good indicator of an area that is normally inundated.

- **Aufwuchs**. Presence or remains of sessile, attached, of free-living nonvascular plants and invertebrates that live on inundated surfaces.

- **Drift lines or rafted debris**. Vegetation or litter that forms lines on substrate in a manner that reveals that the material was once waterborne. It should be noted that these lines also will sometimes form after extreme or unusual hydrologic events.

- **Elevated lichen lines**. Lichens grow on trees and are not tolerant to inundation, therefore, abrupt lines where the communities stop can suggest evidence of standing water.

- **Evidence of aquatic fauna**. Presence of animals that spend all or a portion of their life in water.

- **Hydrologic data**. Historical data that shows that an area has periods of inundation or saturation.

- **Morphological plant adaptations**. Structures plants produce when inundated or saturated and are not produced under normal conditions (example: adventitious roots).

- **Secondary flow channels**. Natural pathways of water flow landward of the primary surface water body. Often, they are parallel to the main channel.

- **Sediment deposition**. Deposited material in positions indicating water transport.

- **Vegetated tussocks or hummocks**. Areas where vegetation is elevated above the natural grade on mounds of built up soil, plant debris, and roots so they are not affected by anaerobic conditions.

- **Water marks.** Stained lines caused by prolonged inundation of water.

Reasonable scientific judgment is the ability to collect and interpret data using knowledge, skills, and experience. Due to variations from the rule that tend to occur in the field, reasonable scientific judgment is essential and is used throughout the delineation process.

Once all of the indicator tools have been observed, they must be entered into the technical delineation procedure. There are four tests to choose from in this procedure, as described below. These tests, along with reasonable scientific judgment, will determine the wetland boundary.

Test 'A'

Obligate Vegetation > Upland Vegetation
and
Hydric Soil Characteristics or Riverwash
or
Hydrologic Indicators

Test 'B'

Obligate + Facultative Wet > 80% (Upland < 20%)
and
Hydric Soil Characteristics or Riverwash
or
Hydrologic Indicators

Test 'C'

This test uses specific soil situations for wetland delineations. In certain situations, certain soil evidence can serve as the sole factor in determining a delineation. The three sections of this are soil taxonomy, saline sands, and frequently flooded and depressional map units. These sections are explained in the manual in more detail.

Test 'D'

Hydric Soil Indicators + Hydrologic Indicators

2.2.2 State Jurisdictional Extent and Location

The FDEP methodology was created based on many other methodologies; therefore, it is not uncommon for delineations completed by other methods, such as the USACE method, to be very similar to, if not the same as, the FDEP method. Such was the case for the delineation performed at HARB. While the USACE method requires that all three parameters be present, the FDEP generally requires that two parameters be present. In the situation at HARB, two parameters would fall out immediately landward of the USACE line, therefore, the line would also represent the State line due the requirements of the Tests 'A,' 'B,' and 'D.' Test 'C' can not be used in this area because the soils are not present.

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3 Wetland Descriptions

To better organize field efforts while conducting the wetland delineation, the following thirteen areas were defined and used to segment the Base. Descriptions of these wetlands as they correspond to the USACE field data sheets (see Attachment A) are described below and depicted on Figure 3-1. These should not be confused with the wetland polygons that were created while doing the WRAP and that are discussed in Section 4. There is no relationship between these descriptions and the WRAP polygons.

- **Wetland "A."** Wetland "A" is located at the southwest corner of the runway. It is west of the "HUSH House," east of a bridge over the Boundary Canal, and south of the road paralleling the runway. The southern part of wetland "A" is bordered by the Boundary Canal and a linear area filled in for an access road. This wetland is a depressional marsh area, most of which is usually inundated. The western part of wetland "A" is primarily a wet prairie with some ditches draining it into the marsh. A canal runs east to west at the northern end of the marsh and is fed by culverts from the northeast. The water in wetland "A" ultimately leaves through a cut in the aforementioned filled-in access road. Within the inundated marsh, very little vegetative cover exists, but the entire area is covered with a periphyton mat. Some of the few vegetative species in the marsh include cattails (*Typha* spp.) and spikerush (*Eleocharis* spp.). Both of these plants are obligate wetland species. The filled-in access road area is dominated by a tree line of Australian pine (*Casuarina* spp.). The wet prairie area of wetland "A" has a diverse range of herbaceous wetland species, including white-top sedge (*Dichromena colorata*), hurricane grass (*Fimbristylis spathacea*), spikerush (*Eleocharis* spp.), bluestem (*Panicum repens*), bacopa (*Bacopa* spp.), Bermuda grass (*Cynodon dactylon*), pennywort (*Hydrocotyle bonariensis*), coinwort (*Centella asiatica*), and beakrush (*Rhyncaspora* spp.). These are all wetland indicator species with the exception of Bermuda grass, which is not widespread and was observed only in a few patchy spots. All of the vegetation in the wet prairie area has been maintained by mowing, therefore, the vegetation in this area consists of ground cover.

- **Wetland "B."** Wetland "B" is located south of wetland "A," is bordered by the "HUSH House" and wetland "A" to the north and west, the Boundary Canal to the south, and an elevation rise to the east. Water is supplied to this area from wetland areas "A" and "D." Once the water has passed through this wetland it flows into the Boundary Canal.

  Wetland "B" is an extensive area of inundated marsh with some small mounded areas caused from the growth of Australian pine (*Casuarina* spp.). Water depths within

wetland "B" can vary from a few inches to 3 or 4 feet. Many of the fringe areas of wetland "B" are covered with Brazilian pepper (*Schinus terebinthifolius*). Both of the aforementioned species are considered invasive exotics in the state of Florida. Within the marsh there is much vegetative cover and much of the substrate is covered with a periphyton mat. Vegetative species in the marsh include cattails (*Typha* spp.), sawgrass (*Cladium jamaicense*), and spikerush (*Eleocharis* spp.). All of these plants are obligate wetland species. This area has accessibility problems so it is not regularly mowed in order to be maintained. Twice a year aerial spraying of herbicide is used for maintenance.

- **Wetland "C."** Wetland "C" is located directly east of wetland "A". It is bordered by the Boundary Canal bridge to the east, the road along the runway to the north, the Boundary Canal to the south, and an elevation rise on the western side of the drainage swale to the west. This wetland is a wet prairie with some depressional marsh within the drainage swale. The water in this area drains to the swale, which leads to the Boundary Canal. The prevalent vegetation in the swale is spikerush (*Eleocharis* spp.) with some cattail (*Typha* spp.). The vegetation in the wet prairie is herbaceous and maintained. Species in this area include white-top sedge (*Dichromena colorata*), hurricane grass (*Fimbristylis spathacea*), spikerush (*Eleocharis* spp.), bluestem (*Panicum repens*), bacopa (*Bacopa* spp.), coinwort (*Centella asiatica*), and beakrush (*Rhyncaspora* spp.). All of the aforementioned species are wetland indicator species.

- **Wetland "D."** Wetland "D" is located north of wetland "A," on the opposite side of the road along the runway. This area also stretches south at the eastern end and is located between the taxiway leading to the "HUSH House" and wetland "A." Two wetlands exist within this section, but they have an elevation rise barrier between them. The northern limit of both these areas is the rise to the runway. The western wetland area is a wet prairie, while the eastern wetland is an inundated marsh with wet prairie fringe areas. The water from the marsh area is drained through a culvert that flows to wetland "A." The western area has no drainage other than through the soil and sometimes water can be seen flowing on to the road. There is some vegetative cover in the inundated marsh and much of the area is covered with a periphyton mat. Some of the vegetative species in the marsh include cattails (*Typha* spp.), sawgrass (*Cladium jamaicense*), and spikerush (*Eleocharis* spp.). All of these plants are obligate wetland species. The wet prairie area to the west and the fringe area around the marsh consist of maintained, herbaceous wetland species. Species in these areas include white-top sedge (*Dichromena colorata*), hurricane grass (*Fimbristylis spathacea*), spikerush (*Eleocharis* spp.), bluestem (*Panicum repens*), bacopa (*Bacopa* spp.), pennywort (*Hydrocotyle bonariensis*), coinwort (*Centella asiatica*), and beakrush (*Rhyncaspora* spp.). There are also a few Australian pines (*Casuarina* spp.) around the marsh area.

- **Wetlands "E" and "I."** Wetlands "E" and "I" have been grouped due to their location and similarities. The road along the runway is the only thing that separates them. Wetland "E" is located along the Boundary Canal east of the "HUSH House" and stops at the road to the old Boy Scout camp. Also included in wetland "E" is the large marsh connected to two small lakes, named Twin Lakes, which have a composition very similar to wetland "B". The Twin Lakes were created as barrow pits. Wetland "I" consists of some depressional areas north of the road along the runway; this area is a wet prairie. The water from these wetlands drains into the Boundary Canal and some culverts from wetland "Y" feed into wetland "E". Wetland "E" is comprised of inundated marsh with wet prairie along the fringes. The large marsh associated with the lakes is much deeper,

with dominant vegetation consisting of cattails (*Typha* spp.) and sawgrass (*Cladium jamaicense*). The growth of Australian pine (*Causarina* spp.) has caused some small mounded areas. Many of the fringe areas of wetland "E" in the lake marsh area are covered with Brazilian pepper (*Schinus terebinthifolius*). The marsh areas along the runway comprise mostly of a periphyton mat with vegetation being comprised of cattails (*Typha* spp.) and spikerush (*Eleocharis* spp.). The vegetation in the fringe wet prairie and wetland "I" is mowed and species include white-top sedge (*Dichromena colorata*), hurricane grass (*Fimbristylis spathacea*), spikerush (*Eleocharis* spp.), bluestem (*Panicum repens*), bacopa (*Bacopa* spp.), pennywort (*Hydrocotyle bonariensis*), coinwort (*Centella asiatica*), and beakrush (*Rhyncaspora* spp.).

- **Wetland "F."** Wetland "F" is located along the Boundary Canal east of the road to the old Boy Scout camp and extending to the end of the runway. The water from this wetland drains into the Boundary Canal. Wetland "F" is comprised of inundated marsh with wet prairie along the fringes. The marsh areas in wetland "F" become narrow and the northern part of this area consists of only wet prairie. The wetland itself becomes very narrow toward the northern end of the runway and finally tapers off. The marsh areas in wetland "F" consist mostly of a periphyton mat with vegetation being comprised of cattails (*Typha* spp.) and spikerush (*Eleocharis* spp.). The vegetation in the fringe wet prairie is mowed and species include white-top sedge (*Dichromena colorata*), hurricane grass (*Fimbristylis spathacea*), spikerush (*Eleocharis* spp.), bluestem (*Panicum repens*), bacopa (*Bacopa* spp.), pennywort (*Hydrocotyle bonariensis*), coinwort (*Centella asiatica*), and beakrush (*Rhyncaspora* spp.).

- **Wetland "G."** Wetland "G" is located at the northeast end of the runway, north of the runway just east of the FANG. The wetland is located along the perimeter road. It is a wet prairie that has no man-made drainage so water percolates through the soil. There are some depressional areas within the wetland that experience inundation longer than the rest of the wetland. The area is maintained through mowing and the ruts from the mowing have caused many of the more depressional areas. This area serves as a drainage basin for the areas around the northern end of the runway, but there are no culverts that feed water into the wetland. The herbaceous wetland vegetation in wetland "G" consists of white-top sedge (*Dichromena colorata*), hurricane grass (*Fimbristylis spathacea*), spikerush (*Eleocharis* spp.), bluestem (*Panicum repens*), bacopa (*Bacopa* spp.), pennywort (*Hydrocotyle bonariensis*), coinwort (*Centella asiatica*), and beakrush (*Rhyncaspora* spp.). There is usually a monoculture of spikerush (*Eleocharis* spp.) in the depressional areas.

- **Wetland "H."** Wetland "H" is located north of the western part of the runway and west of the end of the taxiway. It is comprised of a drainage basin with two ditches running from each side draining into a canal. The drainage basin and the ditches are bordered by an elevation rise to each side of the area. This wetland is a wet prairie with some small areas of long inundation in the drainage ditches. The canal this area drains into eventually feeds into the Boundary Canal. Similar to many areas around the airfield, this wetland is maintained by mowing, so the vegetative species are herbaceous ground cover. There are some spots of periphyton mat showing some periods of inundation. The vegetative species in this area include white-top sedge (*Dichromena colorata*), hurricane grass (*Fimbristylis spathacea*), spikerush (*Eleocharis* spp.), bluestem (*Panicum repens*), bacopa (*Bacopa* spp.), pennywort (Hydrocotyle bonariensis), coinwort (Centella asiatica), and beakrush (*Rhyncaspora* spp.).

- **Wetlands "V," "W," "X," and "Z" (Wetland "Y").** These four areas have been grouped due to their similarity, location, and connectivity. For the purpose of this description the four sections will be collectively referred to as wetland "Y." Wetland "Y" consists of three southernmost parcels located between the runway and the taxiway. Culverts connect the parcels to each other; in addition, culverts connect wetland "Y" to the wetlands south of the runway along the Boundary Canal. A canal runs along the northern side of each of the wetlands and drains these parcels. Wetland "Y" is used as a drainage basin for the runway and taxiway. These wetlands are wet prairies with evidence of prolonged periods of inundation due to periphyton mats that were observed. These areas are maintained by mowing so they have herbaceous ground cover. Vegetative species in wetland "Y" include white-top sedge (*Dichromena colorata*), hurricane grass (*Fimbristylis spathacea*), spikerush (*Eleocharis* spp.), bluestem (*Panicum repens*), bacopa (*Bacopa* spp.), pennywort (*Hydrocotyle bonariensis*), coinwort (*Centella asiatica*), and beakrush (*Rhyncaspora* spp.). The prevalent vegetation in areas closest to the canal with the longest inundation is spikerush (*Eleocharis* spp.). Many wading birds, as well as fish, were observed in wetland "Y."

Table 3-1

Wetland Area Descriptions
Homestead Air Reserve Base, Homestead, Florida

Area	Wetland Type	Hydrology	Soils	Dominant Vegetation
Wetland "A"	fresh water marsh/wet prairie	much stays inundated, drainage basin, culvert feed	Biscayne Marl, shallow to deep histosols	*Typha* spp., *Eleocharis* spp., *Dichromena colorata*, *Panicum repens*, *Rhyncaspora* spp.
Wetland "B"	fresh water marsh	stay inundated, some areas with deep water depths	Biscayne Marl, deep histosols	*Causarina* spp., *Schinus terebithifolius*, *Typha* spp., *Cladium jamaicense*, *Eleocharis* spp.
Wetland "C"	wet prairie	seasonal periods of inundation, drainage basin	Biscayne Marl, shallow histosols	*Bacopa* spp., *Eleocharis* spp., *Dichromena colorata*, *Panicum repens*, *Rhyncaspora* spp.
Wetland "D"	et prairie	seasonal periods of inundation with some prolonged inundation in parts	Biscayne Marl, shallow to deep histosols	*Bacopa* spp., *Eleocharis* spp., *Dichromena colorata*, *Panicum repens*, *Rhyncaspora* spp., *Cladium jamaicense*
Wetland "E"	fresh water marsh/wet prairie	seasonal periods of inundation with prolonged inundation in parts	Biscayne Marl, shallow to deep histosols	*Typha* spp., *Eleocharis* spp., *Dichromena colorata*, *Panicum repens*, *Causarina* spp., *Schinus terebithifolius*,., *Cladium jamaicense*,.
Wetland "F"	fresh water marsh/wet prairie	seasonal periods of inundation with prolonged inundation in parts	Biscayne Marl, shallow to deep histosols	*Bacopa* spp., *Eleocharis* spp., *Dichromena colorata*, *Panicum repens*, *Typha* spp., *Cladium jamaicense*
Wetland "G"	wet prairie	seasonal periods of inundation, drainage basin	Biscayne Marl, shallow histosols	*Bacopa* spp., *Eleocharis* spp., *Dichromena colorata*, *Panicum repens*, *Fimbristylis spathacea*

Table 3-1

Wetland Area Descriptions
Homestead Air Reserve Base, Homestead, Florida

Area	Wetland Type	Hydrology	Soils	Dominant Vegetation
Wetland "H"	wet prairie	seasonal periods of inundation, drainage basin	Biscayne Marl, shallow histosols	*Bacopa* spp., *Eleocharis* spp., *Dichromena colorata*, *Panicum repens*, *Centella asiatica*
Wetland "I"	wet prairie	seasonal periods of inundation	Biscayne Marl, shallow histosols	*Eleocharis* spp., *Dichromena colorata*, *Panicum repens*, *Centella asiatica*, *Rhyncaspora* spp.
Wetland "V"	wet prairie	some periods of prolonged inundation	Biscayne Marl, shallow histosols	*Eleocharis* spp., *Dichromena colorata*, *Panicum repens*, *Fimbristylis spathacea*, *Bacopa* spp.
Wetland "W"	wet prairie	some periods of prolonged inundation	Biscayne Marl, shallow histosols	*Eleocharis* spp., *Dichromena colorata*, *Panicum repens*, *Fimbristylis spathacea*, *Bacopa* spp.
Wetland "X"	wet prairie	some periods of prolonged inundation	Biscayne Marl, shallow histosols	*Eleocharis* spp., *Dichromena colorata*, *Panicum repens*, *Fimbristylis spathacea*, *Bacopa* spp.
Wetland "Z"	wet prairie	some periods of prolonged inundation	Biscayne Marl, shallow histosols	*Eleocharis* spp., *Dichromena colorata*, *Panicum repens*, *Fimbristylis spathacea*,

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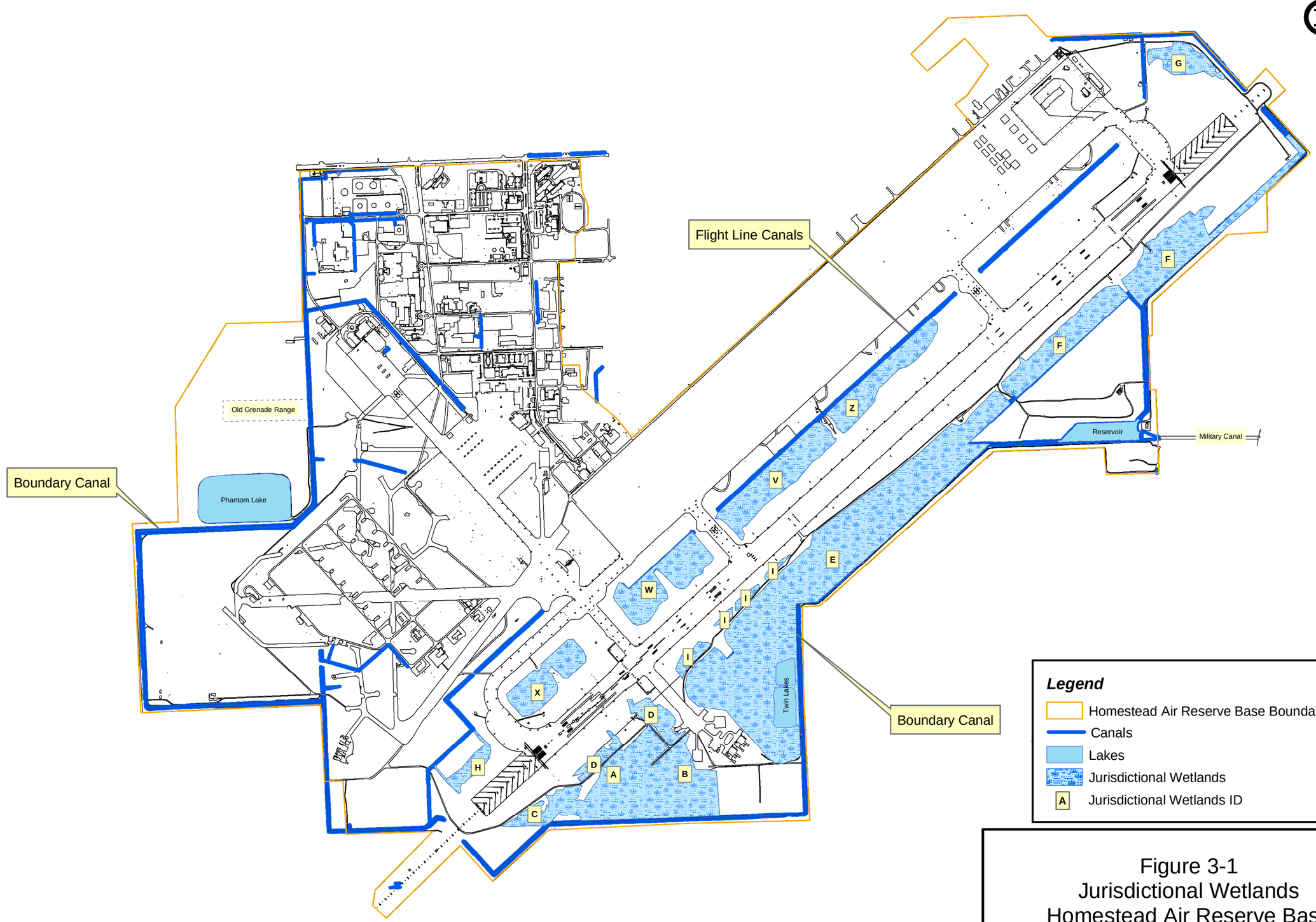

Figure 3-1
Jurisdictional Wetlands
Homestead Air Reserve Base

Source: FEMA, 1996.; HARB, 2001; E&E, 2002 c

4 Wetland Rapid Assessment Procedure

4.1 Introduction

4.1.1 Project Site Description and History

This WRAP report has been prepared on behalf of the Homestead Air Reserve Base Chief of Environmental Flight (HARB CEV), the United States Air Reserve Command (USARC) and the Air Force Center for Environmental Excellence (AFCEE), as part of Work Order # 004-55/01 under Ecology and Environment, Inc.'s (E & E's) Professional Services Agreement (PSA), Resolution # 699-00, with the Miami-Dade Department of Environmental Resources Management (DERM). This WRAP report will be used to determine the functionality of wetland communities on the HARB, and will assist in the preparation of wetlands management plans for the facility.

Jurisdictional wetlands, as delineated by E & E from October to December 2001, currently comprise approximately 233.5 acres of the HARB. By definition, the WRAP was conducted only in those areas considered within the aforementioned jurisdictional lines. Wetland delineation at HARB was performed utilizing methodology set forth in the USACE wetland delineation manual (see Section 1). The wetland areas delineated by E & E personnel generally fell within one of three categories: freshwater marsh, wet prairie, or forested wetland. However, while the wetlands can be grouped into one of these three relatively generic categories, there exist enough distinct differences between the separate wetland communities at HARB to require separation into a number of polygons for the purposes of the WRAP. The following paragraphs provide a general description of the physical characteristics of the wetland areas and surrounding lands. A detailed description of each polygon can be found in Section 4.2 of this WRAP report.

The wetland areas of HARB are primarily contained within the eastern half of the Base and follow the southwest to northeast direction of the HARB taxiway and runway system. The majority of the HARB wetland areas sits south and southeast of the Base's runway, and appears to serve as a

drainage basin system for the runway complex. The HARB wetlands appear to originally have been a natural wetlands system out of which the Base was constructed, however, man-made activities and drainage structures have led to impacts to the system. Most notably, changes to the vegetative regime (including encroachment by invasive or exotic species), hydrology, and interconnectivity of this system were noted. A large proportion of the HARB wetlands contains, or is bordered by, the Base canal system.

South/southeast of the runway, adjacent to the runway surface, is a vegetated area maintained by mechanical and chemical means and classified as uplands. These uplands slope downward into a maintained wetland area with soft, organic soils. An access roadway made from crushed rock runs along the Base adjacent to this wetland area parallel to the runway at this point. Beyond the rock roadway are more of the maintained wetlands, which give way to wetter, marsh-type wetlands. At this point, drainage canals are integrated as part of the marsh areas.

Some portion of the HARB wetlands (approximately 49 acres) sits within the HARB taxiway/runway infield. These wetland areas appear to be drainage basins for the taxiway/runway complex, and have a drainage canal running along their northwest edges. These wetlands are bisected by taxiway crossings to the runway, but are interconnected by a series of culverts.

Two polygons fall within the forested wetlands category, both located within the southwest quadrant of the Base. These areas appear to have been heavily impacted by the creation of uplands within that area for various maintenance activities that take place near the southwest end of the runway and support flight operations.

Finally, there are two separate polygons that appear to be drainage basins, one located within the northeast quadrant of HARB, the other located just southwest of the end of the taxiway. The first area is northeast of the operating area for the FANG, and is maintained on a regular basis. The second area is at the end of the taxiway and is connected by two sloughs to a drainage canal. Both of these areas are similar to the maintained wetlands to the south/southeast of the runway that were described earlier in that they are drier than the marsh areas along the Base canals, but have soft, organic soils. However, these areas were handled as separate polygons due to differences in vegetation.

4.1.2 Objectives

This WRAP report has been prepared in order to support the following objectives:

- Provide a detailed overview of the type and condition of any and all wetland plant communities contained within the subject property;

- Determine impact (if any) to wetland areas due to anthropogenic disturbances to the subject or surrounding property(s); and

- Assign to the subject property one or more descriptive numerical values that can be used for permitting, land use, and/or other purposes associated with wetlands contained within the subject property.

The WRAP is an established methodology used in Florida for assessing a wetland ecological community that takes into account the overall quality of the ecosystem being evaluated through a process of rating a number of predefined variables. The variables include such review items as wildlife habitat, predominant species of flora and fauna, adjacent land uses (current and historical), among other criteria, to give the user a way to quantify the overall functional value of the ecosystem. The WRAP is not intended as a means to compare different wetlands communities to one another, but instead, as a technique to rate each separate ecosystem according to its own attributes and characteristics.

The WRAP, when utilized properly, has been shown to be a simple, accurate and repeatable assessment process that can serve a number of useful purposes. Foremost among these is its application as an ecosystem evaluation tool for permit review authorities. The basic premise behind the performance of a WRAP for a parcel of land is to streamline the review process by meeting the requirements of the various applicable reviewing/permitting agencies. However, the applicability of the WRAP does not end there, as the data collected can be utilized to determine mitigation requirements, to track land use and land impact trends over time, and to offer guidance for future land-use planning.

The WRAP incorporates concepts from the USFWS's Habitat Evaluation Procedure and the SFWMD's Save Our Rivers Project Evaluation Rating Index, both of which utilize measurable variables to assess and assign value to ecological communities. Additionally, the procedure incorporates the basic wetlands delineation requirements of the USACE, the FDEP and the SFWMD.

4.1.3 Scope of the WRAP

Ecological communities are often measured by their proper boundaries and observable physical characteristics, as these are the most easily distinguishable and quantifiable features. However, measuring the true value of ecological communities relies on the understanding that these communities impart much more than just open space or what is immediately observable on the surface. To aid in this measurement, the preparation of the WRAP relies upon the user's evaluation of wetland communities by a point system for predetermined and predefined variables. Within a land parcel, an unlimited number of ecological communities can be assessed, depending upon the site

makeup. It is reasonable to group obviously contiguous wetlands together for assessment purposes. These groupings, referred to as "polygons," are often assigned based upon the similarity of species type and coverage, site hydrology, and impacts to the community. Polygons can be of any size and/or shape to meet the objectives of assessing the distinct ecological community represented; however, it would not be reasonable to attempt to place two obviously distinct wetland communities within the same polygon. Each polygon is then assessed utilizing the variables discussed below.

The WRAP methodology includes the following variables:

- Wildlife utilization;
- Wetland overstory/shrub canopy;
- Wetland vegetative ground cover;
- Adjacent upland/wetland buffer;
- Wetland hydrology; and
- Water quality input and treatment systems.

For each variable, the score assigned can range from zero (0) to three (3), with 3 being the best possible score for a wetland community. The WRAP scoring system explains that a score of 3 is equivalent to the community providing 100 % functional value for the variable being assessed, while scores of two (2) and one (1) are equivalent to 67% and 33% functionality, respectively. The authors of the WRAP recognized that it was inevitable that a community might not meet all the definitional requirements for a whole-number score within a variable; therefore, flexibility in the form of allowing the user to score the site in one-half point increments has been written into the procedure. For example, if the site being assessed falls between the scores of 1 and 2 (providing between 33% and 67% functional value) for a specific variable, the site can be assigned a score of 1.5 for that variable. Additionally, the adjacent buffer and water quality input and treatment variables are broken down to allow separate scoring for each side of a polygon. The scoring for these variables is based upon a percentage of the overall area of the polygon, and therefore, may be scored to as many as two decimal places. Once each variable is scored, all of the points given to the polygon are totaled, and the final number is divided by the total available maximum score that the assessed polygon could have been awarded if it was a 100% functional system for all variables. This final number, the "WRAP score," is a numerical value between 0 and 1. As stated in Section 4.1.2, it is important to note that the intent of performing the WRAP is to evaluate each polygon on its own merits, and not to compare polygons for the purpose of scoring the variables. A brief description of each variable (as described by the

method's authors) follows, while definitions for each variable's scoring system can be found in Tables 4-1 and 4-2 (Miller and Gunsalus 1997).

Wildlife Utilization

The wildlife utilization variable is a measure of observations and/or signs of wildlife, or the potential for wildlife usage, due to such factors as food availability, protective cover, roosting/nesting areas, strategic functionality, and ability to support wildlife. For the most part, wetland fauna is the primary focus of this variable; however, it is recognized that some upland species also can benefit from the utilization of these areas, and that not all wetland areas can support species that need long duration hydroperiods.

Wetland Overstory/Shrub Canopy

This variable is a measure of the health and appropriateness of the wetland shrub and overstory canopy, relative to the type and condition of the wetland habitat being assessed. It is evaluated based upon the food, cover, and nesting/roosting areas provided, as well as the percentage of undesirable (exotic and/or nuisance) plant species. The definitions of canopy and sub-canopy are derived from FDEP published literature. It is important to note that, in addition to field measurements, the percentages of dominant and undesirable species also can be determined through field observation/estimations and the review of aerial photographs.

Wetland Vegetative Ground Cover

This variable is a measure of the presence, health, and appropriateness of the wetland ground cover flora, relative to the type and condition of the wetland habitat being assessed. Ground cover includes those plants that do not fit into the FDEP definitions of canopy or sub-canopy. This ground cover is evaluated based upon the food and refuge it provides to small mammals, birds, macroinvertebrates, reptiles and amphibians, as well as the percentage of undesirable (exotic and/or nuisance) plant species observed. Wetland vegetative ground cover can be significantly influenced by a wide range of direct and indirect means, and tends to be an indicator of such impacts to a wetland community.

Adjacent Upland/Wetland Buffer

A wetland community is often subject to potential disturbances, inputs, etc. from adjacent lands, whether they are uplands or wetlands, but these adjacent "buffers" can act as habitat support for the wetland being assessed. In addition, they can serve as transitional areas to uplands or development, acting as nutrient filters for surface water inputs, and controlling noise and other human-based impacts to the wetland area. This variable attempts to quantify the quality of the lands

adjacent to the wetland being assessed by evaluating the buffers' sizes and attributes as they relate to supporting the wetlands as a viable habitat.

The scoring method for this variable provides for proper weighting of the adjacent buffer areas in respect to their size (i.e., the percentage of land a particular buffer represents surrounding the assessed community). For example, a rectangular-shaped wetland that is twice as long as it is wide has a greater percentage of its buffer on the elongated sides. To account for the size differences of the adjacent buffers, this variable allows the user to characterize and score each adjacent buffer observed, then multiply that score by the percentage of land area it represents. These individual buffer scores are then added to give a final overall buffer score. In this way, proper weighting is given to the larger adjacent buffer areas. This may also lead to a WRAP index score for this variable being in one-tenth increments instead of the one-half increments allowed for other variables.

Wetland Hydrology

This variable is a measure of the hydrology and hydrological indicators of a site. Because this assessment process was designed to be performed within a defined timeframe, it is understood that direct observation of the magnitude and duration of inundation is not always possible. Therefore, in the absence of direct observational data, the user may evaluate the wetland based upon vegetative indicators, soil indicators, and other hydrologic indicators, such as drift lines, lichen lines, algal mats and adventitious roots. It is important to note that signs of altered hydrology, in the form of distressed vegetation, upland plant encroachment, or the hydrologic indicators mentioned, can be caused by either increased or decreased hydroperiod, or by recent weather variations.

Water Quality Input and Treatment

The quantity and quality of the surface water flow into a wetland often directly impacts the health of the wetland community. Therefore, surrounding land uses, and mechanisms for managing surface water flows, are an integral part of the WRAP, although they are weighted to control data skew.

The WRAP utilizes nineteen different land-use categories that can be scored from 0 to 3 based upon the potential nutrient/pollutant loading input to the system. Natural/undeveloped land rates a score of 3, while dairy and feedlot systems rate a score of 0 (presumably due to the high nutrient loads associated with runoff from such facilities).

Additionally, the WRAP utilizes seven runoff pre-treatment categories for assessing the potential effectiveness and efficiency of nutrient and pollutant removal from runoff prior to entry into the wetland system. Pre-treatment categories range from natural/undeveloped land (score of 3), to

Table 4-1

WRAP Variable Scoring Definitions

WRAP VARIABLE	Scores and Definitions			
	0	**1**	**2**	**3**
Wildlife Utilization	EXISTING WETLAND EXHIBITS NO EVIDENCE OF WILDLIFE	EXISTING WETLAND EXHIBITS MINIMAL EVIDENCE OF WILDLIFE UTILIZATION	EXISTING WETLAND EXHIBITS MODERATE EVIDENCE OF WILDLIFE UTILIZATION	EXISTING WETLAND EXHIBITS STRONG EVIDENCE OF WILDLIFE UTILIZATION
	- Existing wetland is heavily impacted - No evidence of Wildlife Utilization - Little or No habitat for native wetland wildlife species	- Minimal evidence of Wildlife Utilization - Little habitat for birds, small mammals and reptiles - Sparse or limited adjacent upland food sources - Site may be located in residential, industrial or commercial developments with frequent human disturbances	- evidence of wetland utilization by small or medium sized mammals and reptiles (observations, tracks, scat) - evidence of aquatic macroinvertebrates, amphibians and/or forage fishes - Adequate adjacent upland food sources - Minimal evidence of human disturbance - Adequate protective cover for wildlife	- Strong evidence of Wildlife Utilization, including large mammals and reptiles - Abundant aquatic macroinvertebrates, amphibians and/or forage fishes - Abundant upland food sources - Negligible evidence of human disturbance - Abundant cover and habitat for wildlife
Wetland Overstory/Shrub Canopy	NO DESIRABLE WETLAND OVERSTORY/SHRUB CANOPY TREES PRESENT	MINIMAL DESIRABLE WETLAND OVERSTORY/SHRUB CANOPY TREES PRESENT	MODERATE AMOUNT OF DESIRABLE WETLAND OVERSTORY/SHRUB CANOPY TREES PRESENT	ABUNDANT AMOUNT OF DESIRABLE WETLAND OVERSTORY/SHRUB CANOPY TREES PRESENT
	- No desirable wetland trees or shrub species - Negligible or little habitat support from seedling trees (if present) - Site subject to recent clear cutting with no evidence of native canopy plant regeneration - Greater than 75% undesirable plant species	- Large amounts (approximately 50%) of undesirable tree or shrub species - Wetland Overstory/Shrub Canopy immature but has some potential for habitat support - Minimal signs of natural recruitment of native canopy and shrub seedlings, or tree coppicing - Few snags, or if many present, it may be an indication of hydrology problems or environmental impacts - Disease or insect damage in live canopy trees	- Few (<25%) undesirable canopy trees/shrubs - Wetland Overstory/Shrub Canopy is providing habitat support - some evidence of natural recruitment of native canopy/shrub seedlings, or tree coppicing - Few snags or den trees - Healthy live canopy trees with Minimal evidence of Disease or insect damage	- No exotic and less than 10% invasive canopy/shrub species present - Good habitat support provided by Wetland Overstory/Shrub Canopy - Strong evidence of natural recruitment of native canopy and shrub seedlings - Few snags or den trees - Healthy live canopy trees with Minimal evidence of Disease or insect damage
Wetland Vegetative Ground Cover	NO DESIRABLE VEGETATIVE GROUND COVER IS PRESENT	MINIMAL DESIRABLE VEGETATED GROUND COVER IS PRESENT	MODERATE AMOUNT OF DESIRABLE VEGETATIVE GROUND COVER IS PRESENT	ABUNDANT DESIRABLE VEGETATIVE GROUND COVER IS PRESENT
	- Ground cover is greater than 75% undesirable plant species - Vegetative Ground cover is intensively maintained, managed or impacted - Site a freshly mulched created mitigation area with no evidence of seed germination	- Ground cover exhibits large amounts (approximately 50%) of undesirable vegetation - Ground cover routinely managed for either aesthetics or agricultural production - Site a newly planted mitigation area with low plant biomass density - Site newly mulched with signs of seed germination	- Few undesirable groundcover plant species are present (less than 25%) - Ground cover slightly impacted (human induced effects) - mulched or planted areas established with desirable native plant species	- Less than 10% nuisance and inappropriate plant species with no exotic plant species - Minimal or not disturbance to Ground cover - area subjected to either managed or natural periodic burns for enhancement of ground cover
Adjacent Upland/Wetland Buffer	NO ADJACENT UPLAND/WETLAND BUFFER	ADJACENT UPLAND/WETLAND BUFFER AVERAGES 30 FEET OR LESS, CONTAINING DESIRABLE PLANT SPECIES	ADJACENT UPLAND/WETLAND BUFFER AVERAGES GREATER THAN 30 FEET BUT LESS THAN 300 FEET, CONTAINING PREDOMINANTLY DESIRABLE PLANT SPECIES	ADJACENT UPLAND/WETLAND BUFFER AVERAGES GREATER THAN 300 FEET CONTAINING PREDOMINANTLY DESIRABLE PLANT SPECIES
	- Buffer non-existent	- Less than 30 feet average width - Mostly desirable plant species which provide cover, food source and roosting areas for wildlife - not connected to wildlife corridors - Greater than 300 feet but dominated (greater than 75%) by invasive exotic or nuisance plant species	- Greater than 30 feet but less than 300 feet average width - Contains desirable plant species which provide cover, food and roosting areas for wildlife - Portions connected with contiguous offsite wetland systems, wildlife corridors - Greater than 300 feet but dominated (greater than 75%) by undesirable noninvasive plant species (e.g. pasture grasses)	- Greater than 300 feet wide average width - Contains predominantly desirable plant species (less than 10% nuisance, and no exotic species) for cover, food and roosting areas for wildlife - connected to wildlife corridor or contiguous with offsite wetland system or areas that are large enough to support habitat for large mammals or reptiles
Wetland Hydrology Indicators	HYDROLOGICAL REGIME HAS BECOME SEVERELY ALTERED WITH STRONG EVIDENCE OF SUCCESSION TO TRANSITIONAL/UPLAND OR OPEN WATER PLANT COMMUNITY	HYDROLOGIC REGIME INADEQUATE TO MAINTAIN A VIABLE WETLAND SYSTEM	HYDROLOGIC REGIME ADEQUATE TO MAINTAIN A VIABLE WETLAND SYSTEM. EXTERNAL FEATURES MAY AFFECT WETLAND HYDROLOGY	HYDROLOGIC REGIME ADEQUATE TO MAINTAIN A VIABLE WETLAND SYSTEM
	- wetland hydrology is severely altered - Hydroperiod inadequate to support wetland plant species for the particular community type - Strong evidence that upland plants are encroaching into the historical wetland area as a result of a decreased Hydroperiod - Die-off of wetland plant species as a result of increased hydroperiod - In sites with an organic soil substrate, there is substantial soil subsidence	- Site Hydroperiod inadequate to maintain the system that is being created, enhanced or preserved - Succession of wetland plant species into transitional/upland plant species - Appropriate vegetation stressed from too much or too Little water - In sites with an organic soil substrate, there is evidence of soil subsidence	- Wetland hydroperiod adequate, although conditions possibly interfering with or influencing the hydroperiod of site (i.e. canals, ditches, swales berms, reduced drainage area, culverts, pumps, control elevation and wellfields) present - Plant community healthy, although there may be some signs of improper hydrology - In sites with an organic soil substrate, there is little evidence of soil subsidence	- Plants healthy with no stress resulting from an improper hydroperiod - Wetland exhibits a natural hydroperiod - Wetland not adjacent to canals, ditches, swales, berms, wellfields or other negative impacts to the wetland within the landscape setting
Water Quality Input and Treatment	**See Table 4-2**			

Source: Miller and Gunsalus 1997.

situations where no treatment exists at all (score of 0). Generally, most of the pre-treatment categories are engineered or include mechanical methods of surface water control.

Table 4-2

Land-Use And Pretreatment Scoring Categories
(WRAP Variable Scoring Definitions for Water Quality Input and Treatment)

Land-Use Category	**Score**
Natural Undeveloped Areas	3
Unimproved Pasture/Rangeland	2.5
Citrus Grove	
Sugarcane	
Low Density Residential	
Low Intensity Commercial	
Low Volume Highway	
Institutional	2
Single Family Residential	
Recreational	
Golf Course	
Moderately Intensive Commercial	1.5
High Volume Highway	
Industrial	
Mining	
Multi-Family Residential	
Improved Pasture	
Row Crop	1
High Intensity Commercial	0.5
Dairy /Feedlot	0
Pre-Treatment Category	
Natural Undeveloped Area	3
Wet Detention w/ Swales	2.5
Wet Detention w/ Dry Detention	
Combination Grass Swales w/ Dry Detention	2
Grass Swale Only/Vegetated Buffer Strip	1
Dry Detention Only	
No Pre-Treatment	0

Source: Miller and Gunsalus 1997.

While there may be a situation(s) in which adjacent land use and/or pre-treatment does not fit into one of the categories listed within the WRAP framework, the WRAP was designed to cover as many possible scenarios as could be reasonably expected under normal, and even some atypical, circumstances. In order to balance the potential impacts of land use and runoff from the total land area surrounding the wetland system, the WRAP requires that the user estimate the area of each land-

use and pre-treatment category and express it as a percentage of the total surrounding land area. This format properly weights the surrounding land uses so that a land use of 1 that takes up a small area would not improperly skew the overall land-use rating for the site. Furthermore, the WRAP combines these two categories into one to give an added protection against skewing of the data. In order to calculate this variable (together referred to as Water Quality) the user must multiply the category score of each land use by their respective percentages, then add them together. The same procedure is followed for the pre-treatment categories. Finally, the two sums are added and then divided by the maximum available score (i.e., 6) for the two variables combined to arrive at a final variable score. As with the Adjacent Upland/Wetland Buffer variable, because this variable's score is calculated, the final index score can be expressed in one-tenth increments. Each of the land-use and pretreatment categories taken into account by the WRAP, along with their respective scores, are listed in Table 4-2.

4.1.4 Project Methodology

E & E personnel prepared this WRAP between December 2001 and February 2002, in accordance with the objectives and scope detailed in the previous sections. In order to properly conduct this WRAP and successfully complete this report, field and in-house activities were required. The work performed by E & E in support of the WRAP and this report is detailed below.

Pre-field activities:

- The limits of the subject property and access to the site were identified. This was accomplished by procuring and reviewing previous reports, location maps, and aerial photographs.
- Surrounding land uses were identified and characterized based upon the aerial photos, anecdotal information and previous observations of the site provided by E & E personnel performing wetlands delineation work within the Base limits.
- A review of the Soil Conservation Survey Map (USGS 1996) for the area including the subject property was reviewed.

Field activities:

- E & E personnel conducted reconnaissance by vehicle of perimeter and center portions of the property (those which were accessible to vehicular traffic).
- E & E personnel identified the different community types within the property and determined, with the most reasonable certainty, the extents of each polygon to be assessed.
- E & E personnel determined the best routes of ingress/egress throughout the property.

- E & E personnel visually inspected the entire property.
- E & E personnel conducted WRAP assessments on the different polygons identified as separate communities. Field observations of wildlife, vegetation, hydrologic indicators, etc. were documented.

Post-field activities:

- E & E personnel assessed field findings/observations.
- Florida Land Use, Cover and Forms Classification System (FLUCCS; Florida Department of Transportation [FDOT] 1999) codes were assigned to each polygon.
- Changes in on-site vegetation were identified through the review of previous wetlands reports provided by staff from the office of the HARB CEV.
- WRAP forms were finalized and WRAP scores were assigned to each community type for each variable.
- Final WRAP scores were calculated for each community identified within the subject property.

4.2 WRAP Assessment: Homestead Air Reserve Base

4.2.1 Community Types

The HARB property consists of approximately 1,937 acres of land located approximately 5 miles to the southeast of the town of Homestead. As previously stated, HARB contains wetlands communities (comprising approximately 233.5 acres of the property) that can be placed into three categories: freshwater marsh, wet prairie, and forested wetland. These categories correspond to the FLUCCS as prepared by the FDOT. The FLUCCS codes observed for the HARB wetlands are: 641-Freshwater Marsh, 643-Wet Prairie and 630-Wetland Forested Mixed. Additionally, two man-made lakes were observed on site and were placed in the FLUCCS category of 520-Lakes. The HARB wetlands consist of twelve (12) different distinct wetland community types, referred to as "polygons" (see Figure 4-1). The polygons were chosen based upon visual observations of vegetation, hydrology, connectivity, and similarity to other nearby communities. The name for each polygon was chosen based upon an easily recognizable feature or other means of recognition (i.e., Polygon G – FANG Wet Prairie was so named based upon its proximity to the FANG operations area). A listing of the polygons can be found below, along with by a brief, general description of each, including justification for determining their FLUCCS codes. More detailed information for each polygon, including WRAP scoring justification of each variable, begins in Section 4.2.2.

1) **Polygon A - Typha/Casurina Marsh**. This polygon, triangular in shape and measuring approximately 23.5 acres in area, sits in the southwest corner of the Base and is impacted by man-made uplands in the area, as well as the Base Boundary Canal, which runs along its south edge. The Boundary Canal drains this area and can sometimes bring substances from other areas into the polygon. This polygon was almost completely inundated during site visits and usage by various wildlife was noted. The vegetative regime consists of a mix of nuisance (i.e., exotic and/or invasive) species and desirable species. This polygon has a wetland canopy, however, it is thin and remains mostly along the edges of the polygon. Due to the lack of a dominance (>66%) by any one species of flora, the FLUCCS code for this community was determined to be *641 Freshwater Marsh*.

2) **Polygon B - Forested Wetland.** This polygon, measuring approximately 23 acres in area, also sits in close proximity to the southwest corner of the Base. It is separated from Polygon A by a man-made upland where equipment is stored and maintenance/testing takes place. Almost triangular in shape, this polygon had areas of inundation during site visits, and contains the twin lakes just inside its eastern edge. The HARB Boundary Canal and an upland rock access roadway act as its eastern border. Polygon C bounds Polygon B along its northwest face. The predominant species of vegetation noted within this polygon was a mixture of nuisance and desirable species. The wetland canopy for this polygon was denser and more widespread than that of Polygon A, and evidence of wildlife usage was abundant. Due to the variable nature of the vegetation within this polygon, and its physical appearance as a predominantly forested area, the FLUCCS code for this community was determined to be *630 Wetland Forested Mixed.*

3) **Polygon C - Central Marsh.** This polygon, measuring approximately 41 acres, is a wet, marsh-like area that parallels the HARB runway from a point that is even to the second to last taxiway-to-runway crossing from the southwest end of the runway, to a point that is even to the second to last taxiway-to-runway crossing from the northeast end of the runway. This polygon contains a portion of one drainage canal, and is bounded by the HARB Boundary Canal along its southeast edge for a portion of its length. The predominant vegetation species noted within this polygon are desirable species, with a small encroachment by a nuisance species. The polygon was completely inundated during site visits, and appears to be affected by the water level within the canals associated with it. By way of either the inundation or man-made maintenance (i.e., aerial spraying), portions of the polygon are unvegetated or have only a periphyton mat. There is no wetland canopy within this polygon, and no evidence of an historical canopy was observed. Due to the lack of a dominance (>66%) by any one species of flora, the FLUCCS code for this community was determined to be *641 Freshwater Marsh*.

4) **Polygon D - Typha/Eleocharis Pond.** This community consists of one relatively small (approximately 4 acres) pond-like marsh that is abutted by uplands on all sides. Located directly north and west of the lawn maintenance building in the southwest area of the Base, this polygon is hydraulically connected, via a culvert, to the northeast edge of Polygon E, but is separated from Polygon E by a narrow access roadway. Despite the hydraulic connection, this community is quite different from Polygon E with regards to vegetative and hydrologic regimes. The predominant vegetation observed within this polygon was an approximate 50/50 split of coverage by nuisance and desirable species, each consisting of separate dense stands within the polygon. Additionally, this polygon was inundated and a periphyton mat was noted during the site visits. There is no wetland canopy within this polygon, and no evidence of an historical canopy was observed. Due

Legend

- Homestead Air Reserve Base Boundary
- Lake
- Boundary Canal

WRAP Polygon:

- A- Typha / Casuarina Marsh
- B- Forested Wetland
- C- Central Marsh
- D- Typha / Eliocharis Pond
- E- Southwest Marsh
- F- East Slough
- G-Fang Wet Prairie
- H- Northeast Marsh
- I- Maintained Wet Prairie
- J- Herbaceous Wet Prairie
- K- West Runway Drainage Basin
- L- Infield Drainage Basin

643 **FLUCCS Code:**

641 - Freshwater Marsh
630 - Wetland Forested Mixed
643 - Wet Prairie
520 - Lakes

Key:
WRAP = Wetland Rapid Assessment Procedure
FLUCCS = Florida Land Use, Cover and Forms Classification System

Source: SFWMD, 1999; FDOT, 1999.

Figure 4-1
WRAP Polygons and FLUCCS Code Map
Homestead Air Reserve Base

to the lack of a dominance (>66%) by any one species of flora, the FLUCCS code for this community was determined to be *641 Freshwater Marsh*.

5) **Polygon E - Southwest Marsh.** This community consists of a wet marsh, approximately 6 acres in area, sandwiched between Polygon A and a portion of Polygon I, in the southwest corner of the Base. Although hydraulically connected to Polygon D along its northeast edge (separated only by a narrow access roadway), the wetland plant species observed within this polygon were different in their growth patterns, suggesting a difference in hydrology. While Polygon D had stands of vegetation in separate areas, the vegetation in this polygon was spread much more evenly throughout the polygon. This is perhaps a function of the effects of a man-made canal that runs through this polygon from southwest to northeast. The polygon was inundated during site visits, with some areas under deeper water than others. Furthermore, other than one small stand of a nuisance species near the pint of connection with Polygon D, this polygon does not exhibit coverage by a nuisance species. There is no wetland canopy within this polygon, and no evidence of an historical canopy was observed. Due to the lack of a dominance (>66%) by any one species of flora, the FLUCCS code for this community was determined to be *641 Freshwater Marsh*.

6) **Polygon F - East Slough.** This community consists of a small (less than 1 acre in area) marsh located in the southwest corner of the Base. Referred to by Base personnel as the East Slough, this marsh appears to have been originally created as a man-made drainage ditch. Bounded to the north by Polygon J and to the south by uplands, this thin strip of land is inundated by water draining through it and into the HARB Boundary Canal, located at its east end. Its western terminus appears to be a crushed-rock access roadway. The wetland plant species that have re-colonized this man-made drainage ditch appeared lush and intermixed, and consist of nuisance and desirable species. There is no wetland canopy within this polygon, and no evidence of an historical canopy was observed. Due to the lack of a dominance (>66%) by any one species of flora, the FLUCCS code for this community was determined to be *641 Freshwater Marsh*.

7) **Polygon G - FANG Wet Prairie.** This community is separated geographically from the other polygons listed, by the HARB taxiway/runway complex. Located due east of the FANG operations area, this wetland community, with an area of approximately 10 acres, appears to be a depressional drainage basin that is maintained frequently. While the area was not inundated during site visits, the soil was saturated and evidence of inundation, in the form of dried periphyton mat remnants and gastropod shells, was observed in areas of lower elevation. Predominate vegetation within this polygon consists of desirable species, and no nuisance species were noted. The community is bordered by uplands and the Base's crushed-rock access roadway. There is no wetland canopy within this polygon, and no evidence of an historical canopy was observed. Due to the physical characteristics of this polygon indicating saturation but not complete inundation, the FLUCCS code for this community was determined to be *643 Wet Prairie*.

8) **Polygon H - Northeast Marsh.** This community is located in the northeast corner of the Base, and measures approximately 12 acres in area. Although connected hydraulically to Polygon C by the Base canal system, it is separated from Polygon C by an upland area and a crushed-rock access roadway, making the connection by culvert only. While sharing many of the same characteristics of Polygon C, this community appeared to contain a wider variety of flora and had slightly different hydrology than Polygon C,

enough of a distinction to be considered its own separate wetland community. Also impacted by the effects of man-made canals running through and bordering it, this polygon is inundated but has less non-vegetated areas than Polygon C does. At the time of the site visits, most of the vegetation was brown and appeared to have been subjected to aerial herbicide spraying. Predominate vegetation within this polygon consists of desirable species. There is no wetland canopy within this polygon, and no evidence of an historical canopy was observed. Due to the lack of a dominance (>66%) by any one species of flora, the FLUCCS code for this community was determined to be *641 Freshwater Marsh*.

9) **Polygon I - Maintained Wet Prairie.** This community type is the most widespread (approximately 54 acres) community within HARB. It consists of a series of narrow strips that are heavily maintained by mowing and aerial spraying. These areas run from southwest to northeast, parallel to the runway, and are, for lack of a better description, a transition zone between the upland vegetated runoff areas from the runway to the wet marsh communities containing the Base canal system. These areas were saturated, and had soft substrates, but were not inundated at the time of the site visits. However, evidence of inundation, in the form of dried periphyton mat remnants and gastropod shells, was noted in the lower lying portions of this polygon. Although these areas are not all directly connected, their similarities led to the determination that it is appropriate to group them together. The predominate flora for this polygon is desirable wetland species, and no evidence of nuisance species was noted. There is no wetland canopy within this polygon, and no evidence of an historical canopy was observed. Due to the physical characteristics of this polygon indicating saturation but not complete inundation, the FLUCCS code for this community was determined to be *643 Wet Prairie*.

10) **Polygon J - Herbaceous Wet Prairie.** This community is a wet herbaceous area, measuring approximately 6 acres, located in the southwest corner of the Base. The HARB access road is located adjacent to, or within close proximity to, the entire north edge of this polygon. This irregularly shaped polygon is abutted by Polygon F in its southwest corner and Polygon I along a portion of its east edge. Although this area is in close proximity to several other polygons (polygons F, I, C, and A), it is distinctly different than those in the direct vicinity, and thus warrants being considered a separate polygon. During the site visits, the site was saturated, but not inundated. Small patches of dried periphyton mat were observed, suggesting periodic inundation. There is no wetland canopy within this polygon, and no evidence of an historical canopy was observed. Predominant wetland flora within this polygon is all desirable species that are intensely maintained by mowing. Due to the physical characteristics of this polygon indicating saturation but not complete inundation, the FLUCCS code for this community was determined to be *643 Wet Prairie.*

11) **Polygon K - West Runway Drainage Basin.** This community is located directly southwest of the last taxiway turn to the southwest end of the HARB runway. It appears that this depressional area, approximately 4 acres in size, is a man-made drainage basin for the taxiway/runway complex. This polygon is connected by two sloughs to a drainage canal that runs through the western end of the Base. This area was predominated by a mixture of nuisance and desirable species, and an intermittent periphyton mat. The polygon was saturated, but not inundated at the time of the site visits, but the periphyton mat suggests periodic inundation. There is no wetland canopy within this polygon, and no evidence of an historical canopy was observed. Due to the

physical characteristics of this polygon indicating saturation but not complete inundation, the FLUCCS code for this community was determined to be *643 Wet Prairie*.

12) **Polygon L - Infield Drainage Basin.** This polygon is made up of a series of drainage basins within the HARB taxiway/runway complex. These basins are interconnected hydraulically by a canal that passes under the taxiway crossovers by way of culverts. These areas, measuring approximately 49 acres combined, are frequently maintained by mowing and aerial spraying. Predominant vegetation within this polygon consists of desirable wetland species. There is no wetland canopy within this polygon, and no evidence of an historical canopy was observed. During the site visits, these basins were saturated and partially inundated. Due to the physical characteristics of this polygon indicating saturation and inundation, and a lack of a dominance (>66%) by any one species of flora, the FLUCCS code for this community was determined to be *641 Freshwater Marsh*.

During the site visit, WRAP forms were completed for each of the aforementioned distinctive wetland communities. Typewritten copies of these WRAP forms can be found in Attachment B. Refer to Figure 4-1 for a map of the subject property showing the approximate extents of these polygons, and their respective FLUCCS codes.

The following sections detail E & E's field/aerial photograph observations of the different community types, as well as each polygon's WRAP scores and justifications for them. This information is presented in a format that follows the WRAP variables to reflect the belief that these polygons make up a larger, diverse wetland community. Table 4-3 summarizes the WRAP scores.

4.2.2 Vegetation

The paragraphs below discuss the predominant flora observed within each polygon. These subsections include the two component variables considered in the WRAP, Wetland Canopy and Wetland Ground Cover. Discussion of both variables together as a combined discourse on the vegetation of each polygon is key to understanding that polygon's functioning as a wetland. Within those polygons not demonstrating a canopy, mention is made of that fact, and no WRAP score is given for that variable.

- **Polygon A.** The dominant plant types in Polygon A are cattail (*Typha* spp.), Australian pine (*Casuarina equisetifolia*), spikerushes (*Eleocharis* spp.) and a periphyton mat. The canopy was dominated by the Australian pine, an invasive/exotic species. The vegetation of this polygon was somewhat segregated, with the cattail, spikerush and periphyton mat mostly in the lower, inundated areas at the center of the polygon, and the Australian pine stands on the outer fringes and in the areas that appeared to be of slightly higher elevation. One observation of note was the presence of what appeared to be a dirt/rock roadway that had been begun into the polygon from the upland maintenance area nearby. This dirt path followed along a line of power poles located within the confines of the polygon. The majority of spikerush within this polygon was concentrated along this same line, from the point where the dirt path ended up into the edge of the polygon.

While the canopy was quite thin and dominated by a nuisance species, there was evidence of wildlife utilization, so a score of 0 was determined as not justified, although a score of 1.0 was considered to be too generous for the polygon. The ground cover was noted to be impacted by human activities, and included dense stands of cattails, an invasive/exotic species. Based on these observations, the wetland canopy variable was given a score of 0.5, while the wetland vegetative ground cover variable was given a score of 1.0.

- **Polygon B.** The dominant plant species observed within this polygon are cattail (*Typha* spp.) and Australian pine (*casuarina equisetifolia*). Australian pine dominated the canopy, which, unlike Polygon A, was more evenly widespread throughout the polygon. Other plant species in the canopy noted during site visits include myrsine (*Myrsine guianensis)*, Brazilian pepper (*Schinus terebinthifolius*), wax myrtle (*Myrica cerifera*) and willow (*Salex* spp.). Additional ground cover vegetation noted includes sawgrass (*Cladium jamaicense*), wax myrtle (*Myrica cerifera*) and assorted ferns. As with Polygon A, the canopy is dominated by Australian pine, but is much denser, and the sub-canopy is denser and more diverse. The ground cover was more diverse as well, but was still dominated by cattail. Based on the above observations, the wetland canopy variable was given a score of 1.0, while the wetland vegetative ground cover variable was given a score of 1.5.

- **Polygon C.** The dominant plant species observed within Polygon C are spikerush (*Eleocharis* spp.), white-top sedge (*Dichromena colorata*), umbrella sedge (*Fuirena* spp.) and arrowhead (*Sagittaria* spp.). Additionally, cattail (*Typha* spp.) and remnants of cattail, as well as a periphyton mat were observed. There is no canopy or sub-canopy within this polygon. The ground cover is herbaceous and is subjected to aerial herbicide application periodically. The polygon vegetative coverage is moderate, and contains less than 25% undesirable plant species. Based on the above observations, the wetland vegetative ground cover was given a score of 2.5, and the wetland canopy was deemed not applicable for scoring.

- **Polygon D.** The predominant vegetation observed within this polygon is cattail (*typha* spp.) and spikerush (*Eleocharis* spp.) and a periphyton mat. This polygon is a pond-like area surrounded by uplands and access roadways for the Base. The vegetative cover is split with an approximate 50% coverage of the cattail and the spikerush, segregated within the polygon. There is no wetland canopy, except for a few Australian pine trees located on an upland area in the southeast corner of the polygon. Based on the above observations, the wetland vegetative ground cover was given a score of 1.5, and the wetland canopy was deemed not applicable for scoring.

- **Polygon E.** The vegetation observed within this polygon consists of spikerush (*Eleocharis* spp.) and a periphyton mat. The polygon is intermittently vegetated and is inundated. The effects of a man-made canal along its northwest edge appear to be hydrologic in that some areas of this marsh are deeper than other areas. Vegetation was noted as denser and healthy in those areas where the water levels are shallower. It is also of note that this area is subject to aerial spraying of herbicide on a periodic basis No wetland canopy exists within this polygon, and no evidence of there ever having been one was observed. Based on the above observations, the wetland vegetative ground cover was given a score of 2, and the wetland canopy was deemed not applicable for scoring.

Table 4-3

Wetlands Community Polygons
Wetlands Rapid Assessment Procedure (WRAP) Scores and Florida Land Use, Cover and Forms Classification System (FLUCCS) Codes
Homestead Air Reserve Base, Homestead, Florida

POLYGON A

TYPHA/CASUARINA MARSH

Approximate Acreage = 22 Acres

WRAP Variables	WRAP Scores
Wildlife Utilization	2.0
Wetland Canopy	0.5
Wetland Vegetative Ground Cover	1.0
Habitat Support/Buffer	2.125
Field Hydrology	2.0
Water Quality Input & Treatment	2.325
WRAP SCORE	**0.55**
FLUCCS CODE	**641 - Freshwater Marsh**

Habitat Support/Buffer

Type	%	Score	Subtotal
Wetlands	35	2.5	0.875
Canal	40	2.5	1.0
Uplands	25	1.0	0.25

Water Quality Input & Treatment

Land Uses

Type	%	Score	Subtotal	
Natural Land	35	3.0	1.05	
Canal	40	2.0	0.8	2.35
Uplands	25	2.0	0.5	

Pre-treatment

Type	%	Score	Subtotal	
Natural Land	35	3.0	1.05	
Canal	40	2.5	1.0	2.3
Uplands	25	1.0	0.25	

POLYGON B

FORESTED WETLAND

Approximate Acreage = 23 Acres

WRAP Variables	WRAP Scores
Wildlife Utilization	2.0
Wetland Canopy	1.0
Wetland Vegetative Ground Cover	1.5
Habitat Support/Buffer	2.11
Field Hydrology	2.0
Water Quality Input & Treatment	2.3
WRAP SCORE	**0.60**
FLUCCS CODE	**630 - Wetland Forested Mixed**

Habitat Support/Buffer

Type	%	Score	Subtotal
Canal/Crops	41	2.5	1.025
Wetlands	33	2.5	0.825
Uplands	26	1.0	0.26

Water Quality Input & Treatment

Land Uses

Type	%	Score	Subtotal	
Canal/Crops	41	2.0	0.82	
Wetlands	33	3.0	0.99	2.33
Uplands	26	2.0	0.52	

Pre-treatment

Type	%	Score	Subtotal	
Canal/Crops	41	2.5	1.025	
Wetlands	33	3.0	0.99	2.27
Uplands	26	1.0	0.26	

POLYGON C

CENTRAL MARSH

Approximate Acreage = 41 Acres

WRAP Variables	WRAP Scores
Wildlife Utilization	2.0
Wetland Canopy	NA
Wetland Vegetative Ground Cover	2.5
Habitat Support/Buffer	1.57
Field Hydrology	2.0
Water Quality Input & Treatment	2.0
WRAP SCORE	**0.67**
FLUCCS CODE	**641 - Freshwater Marsh**

Habitat Support/Buffer

Type	%	Score	Subtotal
Maint. Wet	43	1.5	0.65
Unmaint. Wet	14	2.0	0.28
Uplands	15	0.5	0.075
Canal/Crops	28	2.0	0.56

Water Quality Input & Treatment

Land Uses

Type	%	Score	Subtotal	
Maint. Wet	43	2.0	0.86	
Unmaint. Wet	14	3.0	0.42	2.14
Uplands	15	2.0	0.3	
Canal/Crops	28	2.0	0.56	

Pre-treatment

Type	%	Score	Subtotal	
Maint. Wet	43	1.5	0.65	
Unmaint. Wet	14	3.0	0.42	1.92
Uplands	15	1.0	0.15	
Canal/Crops	28	2.5	0.7	

Table 4-3

Wetlands Community Polygons
Wetlands Rapid Assessment Procedure (WRAP) Scores and Florida Land Use, Cover and Forms Classification System (FLUCCS) Codes
Homestead Air Reserve Base, Homestead, Florida

POLYGON D
TYPHA/ELEOCHARIS POND
Approximate Acreage = 4 Acres

WRAP Variables	WRAP Scores
Wildlife Utilization	1.5
Wetland Canopy	NA
Wetland Vegetative Ground Cover	1.5

Habitat Support/Buffer

Type	%	Score	Subtotal
Uplands	68	1.5	1.02
Polygon A	11	2.0	0.22
Polygon E	21	2.5	0.53

Habitat Support/Buffer: 1.8

Field Hydrology	2.0

Water Quality Input & Treatment

Land Uses

Type	%	Score	Subtotal
Uplands	68	2.0	1.36
Polygon A	11	2.5	0.28
Polygon E	21	2.5	0.53

Land Uses: 2.17

Pre-treatment

Type	%	Score	Subtotal
Uplands	68	1.0	0.68
Polygon A	11	2.5	0.28
Polygon E	21	2.5	0.53

Pre-treatment: 1.49

Water Quality Input & Treatment: 1.83

WRAP SCORE	0.58
FLUCCS CODE	641 - Freshwater Marsh

POLYGON E
SOUTHWEST MARSH
Approximate Acreage = 6 Acres

WRAP Variables	WRAP Scores
Wildlife Utilization	2.0
Wetland Canopy	NA
Wetland Vegetative Ground Cover	2.0

Habitat Support/Buffer

Type	%	Score	Subtotal
Polygon I	44	1.5	0.66
Polygon A	48	2.5	1.2
Polygon D	8	2.0	0.16

Habitat Support/Buffer: 2.0

Field Hydrology	2.0

Water Quality Input & Treatment

Land Uses

Type	%	Score	Subtotal
Polygon I	44	2.0	0.88
Polygon A	48	3.0	1.44
Polygon D	8	2.5	0.2

Land Uses: 2.5

Pre-treatment

Type	%	Score	Subtotal
Polygon I	44	1.0	0.44
Polygon A	48	3.0	1.44
Polygon D	8	1.0	0.08

Pre-treatment: 1.96

Water Quality Input & Treatment: 2.23

WRAP SCORE	0.68
FLUCCS CODE	641 - Freshwater Marsh

POLYGON F
EAST SLOUGH
Approximate Acreage = 1 Acre

WRAP Variables	WRAp Scores
Wildlife Utilization	1.5
Wetland Canopy	NA
Wetland Vegetative Ground Cover	1.5

Habitat Support/Buffer

Type	%	Score	Subtotal
Polygon J	54	2	1.08
Uplands	46	2	0.92

Habitat Support/Buffer: 2.0

Field Hydrology	2.0

Water Quality Input & Treatment

Land Uses

Type	%	Score	Subtotal
Polygon J	54	2.0	1.08
Uplands	46	2.0	0.92

Land Uses: 2.0

Pre-treatment

Type	%	Score	Subtotal
Polygon J	54	2.0	1.08
Uplands	46	2.0	0.92

Pre-treatment: 2.0

Water Quality Input & Treatment: 2.0

WRAP SCORE	0.60
FLUCCS CODE	641 - Freshwater Marsh

Table 4-3

Wetlands Community Polygons
Wetlands Rapid Assessment Procedure (WRAP) Scores and Florida Land Use, Cover and Forms Classification System (FLUCCS) Codes
Homestead Air Reserve Base, Homestead, Florida

POLYGON G
FANG WET PRAIRIE
Approximate Acreage = 10 Acres

WRAP Variables	WRAP Scores
Wildlife Utilization	1.5
Wetland Canopy	NA
Wetland Vegetative Ground Cover	1.5

Habitat Support/Buffer

Type	%	Score	Subtotal
Canal/Nursery	50	2.5	1.25
Uplands	40	2.0	0.8
FANG	10	2.0	0.2

Habitat Support/Buffer: 2.25

Field Hydrology	2.0

Water Quality Input & Treatment

Land Uses

Type	%	Score	Subtotal
Canal/Nursery	50	2.5	1.25
Uplands	50	2.0	1.0

Land Uses: 2.25

Pre-treatment

Type	%	Score	Subtotal
Canal/Nursery	50	2.0	1.0
Uplands	50	2.0	1.0

Pre-treatment: 2.0

Water Quality Input & Treatment: 2.13

WRAP SCORE	0.63
FLUCCS CODE	643 - Wet Prairie

POLYGON H
NORTHEAST MARSH
Approximate Acreage = 12 Acres

WRAP Variables	WRAP Scores
Wildlife Utilization	1.5
Wetland Canopy	NA
Wetland Vegetative Ground Cover	1.5

Habitat Support/Buffer

Type	%	Score	Subtotal
Polygon I	47	2.0	0.94
Uplands/Crops	53	2.0	1.06

Habitat Support/Buffer: 2.0

Field Hydrology	2.0

Water Quality Input & Treatment

Land Uses

Type	%	Score	Subtotal
Polygon I	47	2.0	0.94
Uplands/Crops	53	2.5	1.32

Land Uses: 2.26

Pre-treatment

Type	%	Score	Subtotal
Polygon I	47	2.0	0.94
Uplands/Crops	53	2.0	1.06

Pre-treatment: 2.0

Water Quality Input & Treatment: 2.13

WRAP SCORE	0.61
FLUCCS CODE	641 - Freshwater Marsh

POLYGON I
MAINTAINED WET PRAIRIE
Approximate Acreage = 54 Acres

WRAP Variables	WRAP Scores
Wildlife Utilization	1.0
Wetland Canopy	NA
Wetland Vegetative Ground Cover	1.5

Habitat Support/Buffer

Type	%	Score	Subtotal
Wetlands	36	2.5	0.9
Road/Uplands	64	1.5	0.96

Habitat Support/Buffer: 1.86

Field Hydrology	2.0

Water Quality Input & Treatment

Land Uses

Type	%	Score	Subtotal
Wetlands	36	3.0	1.08
Road/Uplands	64	2.0	1.28

Land Uses: 2.36

Pre-treatment

Type	%	Score	Subtotal
Wetlands	36	3.0	1.08
Road/Uplands	64	2.0	1.28

Pre-treatment: 2.36

Water Quality Input & Treatment: 2.36

WRAP SCORE	0.58
FLUCCS CODE	643 - Wet Prairie

Table 4-3

Wetlands Community Polygons
Wetlands Rapid Assessment Procedure (WRAP) Scores and Florida Land Use, Cover and Forms Classification System (FLUCCS) Codes
Homestead Air Reserve Base, Homestead, Florida

POLYGON J
HERBACEOUS WET PRAIRIE
Approximate Acreage = 6 Acres

WRAP Variables	WRAP Scores
Wildlife Utilization	1.5
Wetland Canopy	NA
Wetland Vegetative Ground Cover	1.5
Habitat Support/Buffer	1.66
Field Hydrology	2.0
Water Quality Input & Treatment	2.16
WRAP SCORE	0.58
FLUCCS CODE	643 - Wet Prairie

Habitat Support/Buffer

Type	%	Score	Subtotal
Road/Uplands	67	1.5	1.0
Wetlands	33	2.0	0.66

Water Quality Input & Treatment

Land Uses				
Type	%	Score	Subtotal	
Road/Uplands	67	2.0	1.34	
Wetlands	33	2.5	0.825	2.16
Pre-treatment				
Type	%	Score	Subtotal	
Road/Uplands	67	2.0	1.34	
Wetlands	33	2.5	0.825	2.16

POLYGON K
WEST RUNWAY DRAINAGE BASIN
Approximate Acreage = 4 Acres

WRAP Variables	WRAP Scores
Wildlife Utilization	1.0
Wetland Canopy	NA
Wetland Vegetative Ground Cover	1.5
Habitat Support/Buffer	1.0
Field Hydrology	2.0
Water Quality Input & Treatment	1.58
WRAP SCORE	0.47
FLUCCS CODE	643 - Wet Prairie

Habitat Support/Buffer

Type	%	Score	Subtotal
Uplands/Canal	30	1.0	0.3
Uplands/Runway	30	1.0	0.3
Uplands/Taxiway	20	1.0	0.2
Uplands/Open	20	1.0	0.2

Water Quality Input & Treatment

Land Uses				
Type	%	Score	Subtotal	
Uplands/Canal	30	2.0	0.6	
Uplands/Runway	30	1.5	0.45	1.85
Uplands/Taxiway	20	1.5	0.3	
Uplands/Open	20	2.5	0.5	
Pre-treatment				
Type	%	Score	Subtotal	
Uplands/Canal	30	2.0	0.6	
Uplands/Runway	30	1.0	0.3	1.3
Uplands/Taxiway	20	1.0	0.2	
Uplands/Open	20	1.0	0.2	

POLYGON L
INFIELD DRAINAGE BASIN
Approximate Acreage = 49 Acres

WRAP Variables	WRAP Scores
Wildlife Utilization	1.0
Wetland Canopy	NA
Wetland Vegetative Ground Cover	1.5
Habitat Support/Buffer	1.0
Field Hydrology	2.0
Water Quality Input & Treatment	1.25
WRAP SCORE	0.45
FLUCCS CODE	641 - Freshwater Marsh

Habitat Support/Buffer

Type	%	Score	Subtotal
Uplands/Taxiway	75	1.0	0.75
Uplands/Runway	25	1.0	0.25

Water Quality Input & Treatment

Land Uses				
Type	%	Score	Subtotal	
Uplands/Taxiway	75	1.5	1.13	
Uplands/Runway	25	1.5	0.37	1.5
Pre-treatment				
Type	%	Score	Subtotal	
Uplands/Taxiway	75	1.0	0.75	
Uplands/Runway	25	1.0	0.25	1.0

Source: Miller and Gunsalus 1997.

- **Polygon F.** This area, also known as the East Slough, is a marsh community that has arisen from a man-made drainage ditch. The area contains dense stands of lush vegetation, dominated by cattail (*typha* spp.), an invasive/exotic species, and spikerush (*Eleocharis* spp.), a desirable wetland plant. Other wetland flora observed includes water hyssop (*Bacopa* spp.), white-top sedge (*Dichromena colorata*) and coinwort (*Centella asiatica*). There is no wetland canopy within this polygon, and no evidence of there ever having been one was observed. Based on the above observations, the wetland vegetative ground cover was given a score of 1.5 due to the amount of cattail observed in this area, and the wetland canopy was deemed not applicable for scoring.

- **Polygon G.** This polygon, located in close proximity to the FANG operations area appeared to be mechanically maintained frequently. All vegetation was short, herb-like growth, but is made up of desirable wetland species. Predominant flora within this area consists of spikerush (*Eleocharis* spp.) and torpedo grass (*Panicum repens*). The dried remains of a periphyton mat was observed during the site visits There is no wetland canopy within this polygon, and no evidence of there ever having been one was observed. Based on the above observations, the wetland vegetative ground cover was given a score of 1.5, and the wetland canopy was deemed not applicable for scoring.

- **Polygon H.** While this polygon is hydraulically connected by one culvert/canal to a portion of Polygon C, this polygon was observed as being less impacted by the effects of the man-made canal within it. The vegetation observed was better mixed, and the water was shallower, allowing for a healthier, denser ground cover community. However, it was also noted at the time of the site visits, that this area had been recently sprayed with an herbicide, as all vegetation was turning, or had turned, brown. Predominant vegetation within this polygon includes spikerush (*Eleocharis* spp.), white-top sedge (*Dichromena colorata*), coinwort (*Centella asiatica*), arrowhead (*Sagittaria* spp.), umbrella sedge (*Fuirena* spp.) and a periphyton mat. There is no wetland canopy within this polygon, and no evidence of there ever having been one was observed. Based on the above observations, the wetland vegetative ground cover was given a score of 1.5, and the wetland canopy was deemed not applicable for scoring.

- **Polygon I.** This polygon is the largest community type found on the HARB property. Although not all portions of it are connected, all of the areas comprising this polygon are virtually identical in vegetative regime. The predominant flora for this polygon is spikerush (*Eleocharis* spp.) and torpedo grass (*Panicum repens*). There is no wetland canopy within this polygon, and no evidence of an historical canopy was observed. Based on the above observations, the wetland vegetative ground cover was given a score of 1.5, and the wetland canopy was deemed not applicable for scoring.

- **Polygon J.** Although this polygon is located in close proximity to several others, it has been determined to be its own separate community based upon its vegetation and hydrology. While it shares the hydrological characteristics of nearby Polygon I, it contains a more diverse vegetative regime, like that of Polygon F (without the nuisance species). The predominant flora within this polygon is spikerush (*Eleocharis* spp.), torpedo grass (*Panicum repens*), coinwort (*Centella asiatica*) and water hyssop (*Bacopa* spp.). This area is subject to intense maintenance by mowing. There is no wetland canopy within this polygon, and no evidence of there ever having been one was observed. Based on the above observations, the wetland vegetative ground cover was given a score of 1.5, and the wetland canopy was deemed not applicable for scoring.

- **Polygon K.** This polygon appears to have been a man-made drainage basin for the HARB runway area, and is hydraulically connected to a series of drainage canals. Vegetation observed consists of cattail (*Typha* spp.), spikerush (*Eleocharis* spp.), water hyssop (*Bacopa* spp.), beakrush (*Rhyncospora* spp.) and an intermittent periphyton mat. This site is subject to maintenance activities (i.e., mowing/aerial herbicide spraying). There is no wetland canopy within this polygon, and no evidence of there ever having been one was observed. Based on the above observations, the wetland vegetative ground cover was given a score of 1.5, and the wetland canopy was deemed not applicable for scoring.

- **Polygon L.** This polygon, which is actually a separate series of drainage basins that are hydraulically connected and share similar physical characteristics (including vegetation), is located within the infield area of the taxiway/runway complex. The basins, presumably, were originally created to draw runoff away from the runway and taxiways, and into the Base's canal system. The predominant vegetation observed consists of spikerush (*Eleocharis* spp.), torpedo grass (*Panicum repens*), coinwort (*Centella asiatica*), beakrush (*Rhyncospora* spp.), and water hyssop (*Bacopa* spp.). There is no wetland canopy within this polygon, and no evidence of there ever having been one was observed. Based on the above observations, the wetland vegetative ground cover was given a score of 1.5, and the wetland canopy was deemed not applicable for scoring.

4.2.3 Wildlife Utilization

The following subsections discuss the on-site observations of the field personnel, as well as anecdotal information provided by Base personnel during site visits. A variety of bird species was observed, as were fish. Additionally, evidence of amphibians, reptiles, mammals, and macroinvertabrates was noted.

- **Polygon A**. This wet marsh area provides suitable habitat for macroinvertebrates, amphibians, reptiles, forage fishes, and birds. The dense stands of cattail provide, while the Australian pine canopy allows for some measure of nesting/roosting. Juvenile/forage fishes were observed during the site visits, and various bird species were noted passing through and wading within the polygon. Raccoon tracks and gastropod shells were noted, and unidentified mammalian scat was observed within a nearby upland clearing/access roadway. Anecdotal information from Base personnel indicated that alligators and caiman were observed in this polygon from time to time. One other factor noted for this area is that it is located, like many of the other polygons on the Base, within the area that is subjected to the bird/wildlife aircraft strike hazard (BASH) control activities that consist of shotguns and fireworks being set off into the air to scare off birds. Additionally, the proximity of this polygon to the runway leaves it subject to aircraft engine noise. Based upon these observations, the wildlife utilization for this polygon was given a score of 2.0

- **Polygon B.** This forest-like wetland community is located in close proximity to other polygons and provides cover, food and nesting space for mammals, reptiles, amphibians and birds. There are also two man-made lakes within this polygon that attract a wide variety of wildlife. Birds noted within this area included double-breasted cormorants, a snowy egret, an osprey and a tri-colored heron. During the site visit, an alligator was observed floating in one of the lakes, and anecdotal information regarding caiman was

forwarded. Fish were observed, as was evidence of gastropods. Mammalian scat was observed within a nearby upland clearing/access roadway. Portions of this polygon are subjected to the BASH control activities, and the proximity of this polygon to the runway leaves it subject to aircraft engine noise. Based upon these observations, the wildlife utilization for this polygon was given a score of 2.0

- **Polygon C.** Polygon C is a low-lying marsh area subject to the influence of man-made drainage canals. In addition to being sufficient as a habitat, it also serves as a corridor between other polygons and uplands. Although there is no canopy for nesting, cover, etc., Polygon B is adjacent to a portion of this area. Egrets, herons and terns were noted, as were mammalian and reptilian tracks. Possible scat (unidentifiable due to degradation) was observed within this polygon during the site visit. Juvenile forage fishes were observed on the shallow water areas, while large fish were noted within the canals that are within this polygon. Gastropod shells were found throughout this polygon as well. Portions of this polygon are subjected to the BASH control activities, and this polygon is subjected to periodic aerial herbicide spraying. The proximity of this polygon to the runway leaves it subject to aircraft engine noise. Based upon these observations, the wildlife utilization for this polygon was given a score of 2.0

- **Polygon D.** This small pond-like area had no canopy, although canopy was evident within a portion of the uplands lining it. The cattail stand observed within this area does provide for some measure of cover, and birds were observed passing through and wading within this polygon. Gastropod shells were noted, and anecdotal information regarding usage by alligators and caiman was forwarded. However, this area is subject to the HARB BASH control activities and aircraft noise, and is adjacent to an upland area where maintenance takes place. Its small size (and carrying capacity) was taken into account when considering the wildlife utilization for this polygon. Based upon these observations, the wildlife utilization for this polygon was given a score of 1.5

- **Polygon E**. This polygon is sandwiched between polygons A, I and D, and serves as a corridor for wildlife to/from those areas. Additionally, it is a sufficient habitat for wading birds (egrets and terns observed), fish, gastropods and bivalves (shells observed). However, it is subject to the Base BASH control activities, aerial spraying and aircraft noise. Based upon these observations, the wildlife utilization for this polygon was given a score of 2.0.

- **Polygon F.** This thin strip, while not providing a canopy for nesting, does provide some measure of cover with dense stands of vegetation. Fish was noted in this polygon, as were gastropod shells, bird tracks and tadpoles. However, it is subject to the Base BASH control activities and aircraft noise. Additionally, its small size (and carrying capacity) was taken into account when considering the wildlife utilization for this polygon. Based upon these observations, the wildlife utilization for this polygon was given a score of 1.5.

- **Polygon G.** This wholly separated polygon is heavily maintained by mowing, and is subjected to man-made impacts, such as the Base crushed rock roadway, drainage canals, and activities at the FANG operations area. However, birds (meadowlarks and a sparrow hawk were observed; egrets and herons were anecdotally forwarded) were noted as were gastropod shells. Anecdotal information regarding feral dogs and amphibians were considered as well. This polygon has no canopy and little cover otherwise. Furthermore, it is subject to the Base BASH control activities and aircraft noise, and its small size (and carrying capacity) was taken into account when considering the wildlife utilization for

this polygon. Based upon these observations, the wildlife utilization for this polygon was given a score of 1.5.

- **Polygon H.** This polygon, similar in appearance to Polygon C and Polygon E, has no adjacent canopy for cover, and therefore, had less indications of wildlife usage. While birds (herons, terns and a black vulture) were observed, no sign of mammalian, amphibian or reptilian utilization was noted. Fish were observed within canals that run through this polygon, and gastropod shells were observed as well. This polygon is subjected to the Base BASH control activities and aerial herbicide spraying, and its proximity to the runway subjects it to aircraft noise. Based upon these observations, the wildlife utilization for this polygon was given a score of 1.5.

- **Polygon I**. This polygon is heavily maintained by mowing and is kept at a height of 7 to 12 inches. Bird species (meadowlark, egrets) were observed, but there was no evidence of macroinvertebrates, mammals, reptiles or amphibians utilization. The area is subjected to the Base BASH control activities, is mostly adjacent to the Base access crushed rock roadway, and its proximity to the runway makes it subject to aircraft noise. Based upon these observations, the wildlife utilization for this polygon was given a score of 1.0.

- **Polygon J.** Portions of this small, irregular shaped polygon are adjacent to Polygon F and portions of Polygon I. Birds observed include meadowlarks, terns, egrets and herons. Gastropod shells were observed as well. This area has no canopy, but may act as a corridor to polygons I, E, and A. No evidence of mammals. Reptiles or amphibians were noted during site visits. It is heavily maintained by mowing, and offers little cover. Furthermore, it is subjected to the Base BASH control activities, is mostly adjacent to the Base access crushed rock roadway, and its proximity to the runway makes it subject to aircraft noise. Based upon these observations, the wildlife utilization for this polygon was given a score of 1.5.

- **Polygon K**. This small drainage basin wetland, located just off the southwest end of the taxiway/runway, is subjected to man-made impacts from vehicular traffic from the Base access roadway and the aircraft traffic from the runway. While dense stands of vegetation offer some cover, there is no canopy, no connection to other wetlands areas. However, Macroinvertebrates (gastropod shells), mammalian scat and birds (meadowlarks, egrets, herons, osprey) were observed within, or along the edges of this polygon. The area is subjected to the Base BASH control activities, and its proximity to the runway makes it subject to aircraft noise. Based upon these observations, the wildlife utilization for this polygon was given a score of 1.0.

- **Polygon L.** These infield drainage basins receive runoff from the taxiways and runway, are subjected to the Base BASH control activities, are maintained frequently, and receive unfiltered aircraft noise and exhaust. Furthermore, there is little to connect them to other wetlands areas on the Base. However, birds (terns, egrets and herons) were observed, and gastropod shells were noted during the site visit. Based upon these observations, the wildlife utilization for this polygon was given a score of 1.0.

4.2.4 Habitat Support/Buffer

Of all the WRAP variables, the Habitat Support/Buffer variable is the most complicated. Determining the extents of a polygon's buffer, to a polygon that generally is not square (or even

rectangular), and then assigning an appropriate score to those buffers requires several reexaminations of the data and aerial photographs. The buffers for the HARB polygons are especially complicated due to the man-made features of the Base, the Boundary Canal that surrounds the Base, and the incidence of vacant land, cropland, and nursery land around the Base near the wetlands areas.

- **Polygon A.** The buffer surrounding Polygon A consists of approximately 40% Boundary Canal, 25%, upland and 35% wetlands (polygons E and D). While the wetlands areas were given a score of 2.5, the upland, based upon its usage as a maintenance area, was given a score of 1.0. The Boundary Canal portion was given a score of 2.5, but that was due, in part, to the occurrence of cropland (a food and cover source) beyond the canal. Based on the above observations, the score for the habitat support/buffer surrounding Polygon A was calculated to be 2.125.

- **Polygon B.** The buffer surrounding Polygon B consists of approximately 41% Boundary Canal, followed by cropland; 33% wetlands (Polygon C); and 26% uplands (maintenance area). The Boundary Canal and wetlands were given sores of 2.5, while the upland received a score of 1.0. Based on the above observations, the score for the habitat support/buffer surrounding Polygon B was calculated to be 2.33.

- **Polygon C.** The buffer surrounding Polygon C consists of approximately 43% maintained (mowed) wetland (Polygon I), 14% unmowed wetland (Polygon B), 15% upland/roadway, and 28% Boundary Canal followed by cropland. The mowed wetland received a score of 1.5; the unmowed wetland received a score of 2.0. Based on the above observations, the score for the habitat support/buffer surrounding Polygon C was calculated to be 2.14.

- **Polygon D.** The buffer surrounding Polygon D consists of approximately 68% uplands (mostly maintenance area and access roadways) and 32% wetlands (11% Polygon A and 21 % Polygon E). The uplands area was given a score of 1.5, while the wetlands were given scores of 2 (Polygon A) and 2.5 (Polygon E), respectively. Based on the above observations, the score for the habitat support/buffer surrounding Polygon D was calculated to be 1.8.

- **Polygon E**. The buffer surrounding Polygon E consists of 100% wetlands (48% polygon A, 44% Polygon I, and 8% Polygon D). Polygon A was given a score of 2.5, Polygon I was given a score of 1.5, and Polygon D was given a score of 2.0. Based on the above observations, the score for the habitat support/buffer surrounding Polygon E was calculated to be 2.0.

- **Polygon F.** The buffer surrounding Polygon F consists of approximately 54% maintained wetlands (Polygon I) and 46% uplands. Each buffer for this polygon was given a score of 2.0. Based on the above observations, the score for the habitat support/buffer surrounding Polygon F was calculated to be 2.0.

- **Polygon G.** The buffer surrounding Polygon G consists of 100% uplands areas. To the north, northeast and East (approximately 50%) is the Base access crushed rock roadway, followed by a small swale, the Base Boundary Canal and a private nursery. To the south, southeast and southwest (approximately 40%) is an open area, followed by the Base taxiway/runway complex. To the west (approximately 10%) is the Base access roadway, followed by a small drainage canal, a large swale and the FANG operations area. The

north/northeast/east portion of the buffer was given a score of 2.5, based upon the proximity to the nursery, which can provide food and cover. The other two buffer areas were both given a score of 2.0. Based on the above observations, the score for the habitat support/buffer surrounding Polygon G was calculated to be 2.25.

- **Polygon H.** Polygon H is surrounded to the north, northeast and northwest by Polygon I, a maintained herbaceous wetland area, and to the south, southeast, and southwest by canals, followed by maintained upland areas and then off-Base cropland. The southwest edge of the polygon is adjacent to an upland area with a crushed rock roadway that separates Polygon H from Polygon C. The score given to each of these buffer areas is a 2.0, resulting in a final calculated habitat support/buffer score of 2.0 for Polygon H.

- **Polygon I.** The buffer surrounding Polygon I consists of approximately 64% uplands areas and 36 % wetlands areas. Polygon I is actually a series of thin, partially unconnected maintained swales that occur near the upland crushed rock Base access roadway, and the lower, marsh-like wetlands. The portion of buffer for Polygon I that is wetlands was given a score of 2.5, while the uplands portions of the buffer were given a score of 1.5. Based on the above observations, the score for the habitat support/buffer surrounding Polygon I was calculated to be 1.86.

- **Polygon J.** Polygon J is an herbaceous, maintained wetland area that is bounded to the north, northwest, and west by the Base crushed-rock access roadway, followed by uplands, to the east by a portion of upland and by a portion of Polygon I, and to the south by a portion of upland and Polygon F. The roadway/uplands portions of the buffer (approximately 67%) were given a score of 1.5, while the wetlands portions of the buffer (approximately 33%) were given a score of 2.0. Based on the above observations, the score for the habitat support/buffer surrounding Polygon J was calculated to be 1.66.

- **Polygon K.** Polygon K is a drainage basin located just off the southwest end of the taxiway/runway complex. This depressional area is surrounded on all sides by uplands, and is within close proximity to the flight line of the Base. To the north (approximately 30%) is uplands, followed by a drainage canal and a portion of the Base that supports flight operations. To the south (approximately 30%) is uplands, followed by the runway, a maintained vegetated swale and a portion of the Base wetlands. To the east (approximately 20%) is uplands, followed by the taxiway/runway complex. To the west (approximately 20%) is uplands, followed by a maintained vegetated swale, and then open space. Each of these buffers was given a score of 1.0; thus, the score for the habitat support/buffer surrounding Polygon K was calculated to be 1.0.

- **Polygon L.** Polygon L is a series of drainage basins within the infield areas of the taxiway/runway complex, separated by taxiway crossovers to the runway, but interconnected by a canal and a series of culverts. These areas are surrounded by upland vegetated swales that are, on average, approximately two hundred feet in width. Beyond these swales are the taxiways and runway of the Base. The polygon sections are subjected to intense maintenance, BASH control activities, high levels of aircraft noise and aircraft exhaust. The uplands and taxiway/runway buffer comprises 100% of the total buffer for this polygon, and was given a score of 1.0; therefore, the total score of the buffer surrounding Polygon K was calculated to be 1.0.

4.2.5 Hydrology

The hydroperiod of the onsite wetland communities is primarily affected by rainfall, storm water runoff from adjacent uplands, the presence of drainage ditches or canals, and ground water recharge. The majority of the subject wetlands (polygons A, B, C, D, E, F, H, I, and J) are bounded on the south, east, and west by the Base property Boundary Canal, and on the north by maintained vegetated uplands, followed by the Base runway. Polygon G is bounded on the north and east by the Base property Boundary Canal, and on the south and west by maintained vegetated uplands and flight operations areas. Polygons K and L, while being associated with canals, are bounded by the Base taxiway/runway complex and maintained vegetated uplands. It appears that the Base wetlands have been configured for the purpose of receiving, retaining, and redirecting the storm runoff from the Base taxiway/runway system. Maps issued by the Federal Emergency Management Agency (FEMA) in 1996 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 3-5 of the INRMP; USAF and Federal Aviation Administration [FAA], 2000).

Polygons A, B, C, D, E, F, H, I, and J are situated on the south side of the HARB runway, and, with the exception of polygons A and B, tend to parallel the runway's southwest to northeast direction. Polygons A and B are irregular-shaped parcels, most closely approximating triangular shapes, that extend southward toward the Base boundary. Polygon G is situated north of the northeast end of the runway. Polygons K and L are situated within the taxiway/runway area, and tend to run parallel with the runway from southwest to northeast.

The site visits in support of the WRAP were conducted in December 2001and February 2002, which is typically within the south Florida dry season. Polygons A, C, D, E, F, and H, and portions of polygons B and L were inundated with approximately two to six inches of water, and the water was to the top of the canals within these areas. Polygons G, I, J, K, as well as portions of polygons B and L, were saturated, but not inundated. It appears that the canals within polygons C, E, H, L, and K were designed and constructed in order to draw water away from the taxiway/runway system and surrounding areas.

Generally, the predominant direction of ground water flow in south Florida is to the southeast, unless affected by localized influences such as well fields, canals, or large water bodies (i.e., lakes, bays, etc.). Based on a review of the site topography and regional hydrogeology (USGS 1991), E & E determined that the general flow direction for this portion of HARB is predominantly to the south-southeast. This observation does not include polygons G, K, and L, where the flow appears to have been designed to flow locally from all directions to a centralized retaining area. All of the canals within the Base appear to flow into the Base Boundary Canal that eventually feeds into the

Military Canal located at the eastern end of the Base. From there, the Military Canal flows eastward into Biscayne Bay, a distance of approximately 1.5 miles. The construction of the Base altered the original hydrology of the property, and the series of canals has potentially caused a reduction in the on-site hydroperiod, however the degree of influence is not believed to be significant. At the time of the site visit, the vitality of the hydrophytic vegetation was generally high (although impacted by maintenance activities) and recruitment of upland invasive plant species was minimal. Additionally, a healthy periphyton mat was present throughout the marsh areas.

According to the published Soil Survey of Dade County (United States Department of Agriculture 1996), the majority of the subject property is underlain by either Biscayne marl or Udorthents, limestone substratum. Biscayne marl is considered a hydric soil, which was confirmed based on direct observation of soil characteristics in the field. Udorthents, on the other hand, are not necessarily hydric soils, as they are commonly the result of dredge-and-fill activities (material dredged from one area and spread in a layer over another area). The soil survey describes Biscayne marl as "a very poorly drained soil, occurring on broad, low coastal flats. Typically, the surface layer is about 5 inches of gray marl that has a texture of silt loam." The underlying material, to a depth of about 17 inches, is marl that has a silt loam texture and is gray or grayish brown. At approximately 17 inches, porous limestone is often encountered. The water table in this soil type typically remains at or above the surface for two to four months during the year, but can recede to a depth of 20 inches during drier months. The permeability of Biscayne marl is described as moderate. As previously stated the Udorthents consist of fill material that is well drained. Typically, this fill is an average of 30 inches thick. This soil type varies greatly in makeup, but commonly consists of 4 inches of gray sand with gravel, followed by approximately 26 inches of light gray limestone fragments. At approximately 30 inches, porous limestone is often encountered. There is no typical depth to water for this soil type, but its permeability is described as being rapid.

The presence of the Biscayne marl and Udorthents soils types were confirmed during site visits in support of the jurisdictional wetland boundaries delineation, and during the WRAP process (see Table 3-1). In general, the hydrology within the HARB polygons appeared to be sufficient to support their respective wetland communities, however, man-made impacts (canals, swales, culverts, etc.) were noted, and some improper (too much or too little water) hydrology was observed in some areas. Based on the above observations, all of the HARB polygons (A through L) were given a wetland hydrology score of 2.0.

4.2.6 Water Quality Input and Treatment

The water quality variable of the rating index is a measure of the quality of the surface water flowing into the subject wetland from adjacent land uses. The percent and type of surrounding land uses, as well as any on-site pretreatment of surface waters prior to the discharge into wetlands, is considered. During the site visit, there were no visual indicators of poor water quality observed in any of the wetland community areas, however, visual observation of some of the input areas indicated there is potential for degradation from low quality inputs to the wetlands. It is important to note that, although the WRAP provides specific land-use and pretreatment categories for the purposes of giving a score to these adjacent areas (see Table 4-2), not all possible types are covered in the WRAP scoring list. Therefore, in some instances, an adjacent land use was given a score equal to that of a land use that most closely approximated the actual land use. For example, while there is no land-use category for an Air Reserve base runway, an argument can certainly be made for that runway to be considered as much of an impact as a high volume highway. Observations and justifications for the Land-Use and pretreatment scoring are discussed in more detail in the following paragraphs.

- **Polygon A.** The land adjacent to Polygon A consists of approximately 35% undeveloped natural lands, 40% Base Boundary Canal, and 25% uplands with low to moderate intensity industrial activities (maintenance area). Since the WRAP has a scoring category for natural areas, the 35% of adjacent lands that comprise natural areas was given a score of 3.0. The Base Boundary Canal was handled differently in that, as it currently is used as a boundary to separate the Base from off-Base lands, and it serves as a drainage canal for the area, it could not be considered natural land. Because it does not fit into any of the land-use categories within the WRAP, it was given a land-use score of 2.0, approximating a recreational area. For pretreatment, the canal was approximated to a wet detention type of system, and thus was given a score of 2.5. The final 25% of adjacent land, the uplands portion that contains a maintenance area for the Base, was given a land-use score of 2.0, based upon the outlook that it did not fit into the industrial category (1.5), nor did it fit into the low intensity commercial category (2.5). The pretreatment category for this area was approximated as a grass swale/buffer strip only, and thus was given a score of 1.0. Therefore, based upon the above observations, the Water Quality Input and Treatment score for Polygon A was calculated to be 2.325.

- **Polygon B.** The land adjacent to Polygon B consists of approximately 41% Boundary Canal, 33% wetlands (Polygon C), and 26% uplands with moderate intensity industrial activities (maintenance area). The 33% wetlands area was given a score comparable to natural lands, 3.0. The 41% Boundary Canal was given a land-use score of 2.0 and a pretreatment score of 2.5. The 26% uplands area was given a land-use score of 2.0 and a pretreatment score of 1.0 (grassy swale/buffer strip only). Therefore, based upon the above observations, the Water Quality Input and Treatment score for Polygon B was calculated to be 2.30.

- **Polygon C.** The land adjacent to Polygon C consists of approximately 43% maintained wetlands (Polygon I), 14% unmaintained wetlands (Polygon B), 15% uplands (maintenance area), and 28% Boundary Canal, followed by cropland. The 43% area

consisting of maintained wetlands was considered to be comparable to a golf course in land use based upon the frequency of maintenance mowing to this area. Thus, this area was given a score of 2.0. For pretreatment, since this area seemed to be designed for drainage and as a feeder system into wetter areas (such as Polygon C), this area was considered between a grass swale/buffer strip and detention area, and thus was given a score of 1.5. The 14% unmaintained wetland was given a land-use score of 2.0 based upon the fact that a portion of it is subjected to periodic herbicide spraying. This area was given a score of 3.0, natural land, for the purposes of pretreatment. The 15% uplands area, as described in the discussions for polygons A and B was given a land-use score of 2.0 and a pretreatment score of 1.0. Finally, the Boundary Canal area, which was also discussed previously, was given a land-use score of 2.0 and a pretreatment score of 2.5. Therefore, based upon the above observations, the Water Quality Input and Treatment score for Polygon C was calculated to be 2.00.

- **Polygon D**. The land adjacent to Polygon D consists of approximately 68% of uplands (maintenance area), 11% wetlands (Polygon A) and 21 % wetlands (Polygon E). The 68% area has been previously described and was given a land-use score of 2.0 and a pretreatment score of 1.0. The 11% area, consisting of a portion of Polygon A, was considered to be natural land, but subjected to human induced impacts, and therefore, received a land-use and a pretreatment score of 2.5. The 21% area, consisting of a portion of Polygon E, was also considered to be natural land with human induced impacts, and therefore, also received scores of 2.5 for land use and pretreatment. Therefore, based upon the above observations, the Water Quality Input and Treatment score for Polygon D was calculated to be 1.83.

- **Polygon E.** The land adjacent to Polygon E consists of 100% wetlands areas, 44% abutted by a portion of Polygon I, 48% abutted by a portion of Polygon A, and 8% abutted by a portion of Polygon D. Polygon I is a mechanically maintained wet prairie that, as discussed previously, was considered to be comparable to a golf course type of land use and a grass swale/buffer only pretreatment. Therefore, this portion of the adjacent land was given a land-use score of 2.0 and a pretreatment score of 1.0. Polygon A (the area comprising 48% of adjacent land) is a mostly natural, though disturbed wetland. However, based upon field observations, this area was considered comparable to natural undeveloped land for the land-use and pretreatment categories. Therefore, this area received scores of 3.0 for land use and pretreatment. Polygon D is a relatively small pond-like drainage area with cattail and spikerush stands. Since this polygon is a natural area with human induced impacts, it was given a land-use score of 2.5 and a pretreatment score of 1.0. Therefore, based upon the above observations, the Water Quality Input and Treatment score for Polygon E was calculated to be 2.25.

- **Polygon F.** Polygon F is abutted by a portion of Polygon J (maintained wet prairie) on its north side, and by natural uplands on its south side. Polygon J makes up approximately 54 % of the land adjacent to Polygon F, while the uplands make up the other 46%. Both Polygon J and the uplands are mechanically maintained and are considered comparable land uses to a golf course. Therefore, both were given a land-use score of 2.0. For pretreatment, these areas were both considered comparable to grass swales with some form of dry detention. Therefore, the pretreatment score given to these areas is a 2.0. Therefore, based upon the above observations, the Water Quality Input and Treatment score for Polygon F was calculated to be 2.00.

- **Polygon G.** The land adjacent to Polygon G consists of a low-volume, crushed-rock roadway to the west/north and northeast of the polygon (approximately 50% of the area), and a maintained uplands area to the east/southeast/south/southwest of the polygon (approximately 50% of the area). Low-volume highway is a land-use category as described within the WRAP process. The score for such a land use is 2.5. Pretreatment for the roadway area was given a score of 2.0, comparable to a grassy swale with dry detention. The maintained uplands were considered comparable to a golf course type of land use, and therefore received a score of 2.0. The pretreatment score given to the uplands was a 2.0. Therefore, based upon the above observations, the Water Quality Input and Treatment score for Polygon G was calculated to be 2.13.

- **Polygon H.** The land adjacent to Polygon H consists of approximately 47% maintained wetland (portion of Polygon I) and 53% uplands (rock road, open land). The maintained wetlands of Polygon I have been discussed in previous portions of this section as having a land-use score of 2.0, however, unlike previous polygons, at this location the pretreatment score was determined to be comparable to that of a grass swale with dry detention; thus this area received a score of 2.0. The uplands areas surrounding this polygon were given a land-use score of 2.5 (comparable to low-volume highway and unimproved pasture) and a pretreatment score of 2.0 (grass swale with dry detention). Therefore, based upon the above observations, the Water Quality Input and Treatment score for Polygon H was calculated to be 2.13.

- **Polygon I.** Polygon I, as previously described is a maintained wet prairie located between the Base rock roadway and the wetter marsh polygons. This polygon serves as a drainage basin from the uplands adjacent to the runway and roadway to these marshlands. The rock road and uplands make up approximately 64% of the lands adjacent to this polygon, while wetlands make up the other 36%. While the roadway/uplands might have been expected to receive a score of 2.5 (for low-volume highway and/or unimproved pasture), they were in actuality given a land-use score of 2.0, to reflect the proximity of the Base runway. Additionally, these uplands areas were given a pretreatment score of 2.0 due to their comparability to a grass swale with dry detention. The wetlands areas adjacent to this polygon were considered to be natural areas, and despite periodic human disturbance of aerial herbicide spraying, were given a land-use and pretreatment score of 3.0. Therefore, based upon the above observations, the Water Quality Input and Treatment score for Polygon I was calculated to be 2.36.

- **Polygon J.** The land adjacent to Polygon J consists of approximately 67% uplands and 33% wetlands (portions of polygons F and I). The uplands areas were given land-use and pretreatment scores of 2.0, while the wetlands received land-use and pretreatment scores of 2.5. Therefore, based upon the above observations, the Water Quality Input and Treatment score for Polygon J was calculated to be 2.16.

- **Polygon K**. The land adjacent to Polygon K consists of 100% uplands areas. It is the land usage contiguous to those areas that was considered in scoring this Polygon, as it is a drainage basin located southwest of the taxiway/runway system. To the north (approximately 30%) is an upland swale, followed by a drainage canal, then the Base. To the south (approximately 30%) is an upland swale, followed by a portion of the runway. To the east (approximately 20%) is an upland swale, followed by the southwest-most taxiway crossover to the runway. To the west (approximately 20%) is an upland swale, followed by the rock roadway and then open space. The land-use scores given to the adjacent areas of this polygon are as follows: north – 2.0 (between low intensity

commercial and industrial), south – 1.5 (comparable to a high volume highway), east – 1.5 (comparable to a high volume highway) and west – 2.5 (low-volume highway/unimproved pasture). The pretreatment scores for these areas are as follows: north – 2.0 (comparable to grass swale with dry detention), south, east and west – 1.0 (grass swale/buffer only). Therefore, based upon the above observations, the Water Quality Input and Treatment score for Polygon K was calculated to be 1.58.

- **Polygon L.** This polygon is surrounded on all sides by uplands that are contiguous to the taxiway/runway system. The land-use score given for these uplands was a 1.5, comparable to a high-volume highway. The pretreatment score for these uplands was determined to be a 1.0, as a grass swale/buffer only. Therefore, based upon the above observations, the Water Quality Input and Treatment score for Polygon L was calculated to be 1.25.

4.3 Conclusions and Recommendations

E & E conducted field survey activities and office reviews of the data between October 2001 and February 2002. The field surveys consisted of wetland delineations and WRAPs conducted at each of the wetland communities observed on the subject property. E & E was able to access and traverse the entire perimeter of the subject property and approximately 80% of the interior areas. Based on the findings of E & E's field and in-house investigations, the subject property was determined to consist of twelve (12) different distinct wetland communities, or polygons as described below. Table 4-4 provides the final WRAP scores for each of the polygons based upon the scoring for each polygon, per the WRAP methodology.

Table 4-4

Wetland Rapid Assessment Procedure Scores

Polygon	Area	Acreage	FLUCCS	Wrap Score
A	Typha/Casurina Marsh	22	641 Freshwater Marsh	0.55
B	Forested Wetland	23	630 Wetland Forest Mixed	0.60
C	Central Marsh	41	641 Freshwater Marsh	0.67
D	Typha/Eleocharis Pond	4	641 Freshwater Marsh	0.58
E	Southwest Marsh	6	641 Freshwater Marsh	0.68
F	East Slough	1	641 Freshwater Marsh	0.60
G	FANG Wet Prairie	10	643 Wet Prairie	0.63
H	Northeast Marsh	12	643 Wet Prairie	0.61
I	Maintained Wet Prairie	54	643 Wet Prairie	0.58
J	Herbaceous Wet Prairie	6	643 Wet Prairie	0.58
K	West Runway Drainage Basin	4	643 Wet Prairie	0.47
L	Infield Drainage Basin	49	641 Freshwater Marsh	0.45

The wetland communities located at the HARB display similar attributes and functions to that of a disturbed wetland system. The influence the Base property Boundary Canal and other man-made impacts have had on the wetland systems appear to be significant. Some of these impacts include drainage canals intersecting throughout the wetlands, intense maintenance of wetland areas by mechanical and chemical means, control of the movement of bird and other species within the area (to minimize bird-aircraft strike hazards) and flight operations. The examination of the wetland groundcover and canopy, wildlife utilization, hydrology, habitat buffer, and water quality all support the conclusion that all of the on-site wetland communities have been impacted, to some extent, by military/industrial activities. The fact that these activities, and, therefore, the impacts to the wetlands, are minimized is due, in part, to the current status of the Base. Additionally, HARB has undertaken some management of these areas; however, safety in flight operations is obviously of the highest priority. The presence of nuisance plants, especially cattail and Australian pine, and the obvious alterations to the site hydrology, as well as wildlife control activities resulted in lower WRAP scores in some of the wetland communities than might have been expected.

The creation of borrow pits within one of the polygons to provide fill was another observed alteration to the subject property. However, these ponds were obviously utilized by a variety of wildlife, and it is not believed that they have significantly altered the hydroperiod or function of the adjacent forested wetlands. For the most part, the freshwater marsh wetland areas appear to provide suitable habitat for amphibians, reptiles, macroinvertebrates, fish and wading birds, while the canopy present in the forested wetland area also provides sites for birds to nest and perch. Protective cover is available within the denser areas of the marshes, as well as within the forested wetland areas. Mammalian wildlife utilization of the on-site wetlands was confirmed by the presence of scat and tracks.

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5 Management Plan

5.1 Current Management Practices

Currently the wetlands management undertaken by HARB on the Base consists of measures that help maintain the clear zones around the airfield and control the potential for BASH incidents. Both of these objectives are meant to ensure the safety of flight crews and passengers, and prevent damage to aircraft. The two maintenance procedures used are mowing and aerial spraying. The goal is to have airfield safety while maintaining "no net loss" of wetlands.

The mowing regime maintains the vegetation in a 250-foot-wide strip parallel to the runway. A contractor does the mowing on a year-round basis in order to maintain a vegetation height of approximately 7 to 12 inches. Additionally, aerial spraying of a herbicide is used to maintain wetland areas south of the runway that is inundated for long periods of time. These inundated areas are sprayed due to their relative inaccessibility by mechanical mowing apparatus. During site visits to the Base, wetter areas that had been recently mowed showed signs of tire ruts from the machines. The herbicide used for the inundated areas is a named brand – Rodeo – and subcontractors apply it twice a year by helicopter at an average speed of 5 miles per hour. The helicopter carries an 80-gallon mix, and can cover 60 acres at an application rate of 10%. While spraying, the helicopter is required to maintain a buffer of 20 feet from the open-water canals located on the Base. These procedures are overseen by Antonio Alvarez, HARB Grounds Maintenance, Engineering Department. Key state and federal agencies also are involved in order to draw upon their expertise for compliance issues when dealing with wildlife.

5.2 Airfield Safety

Two programs must be implemented on all Air Force bases in order to provide for aircraft safety – an airfield clearance program and a BASH program. The airfield clearance program is enacted to allow for the possibility that if a problem with an aircraft's takeoff or landing occurs, there

will be ample room for the pilot to right the plane or land without causing serious damage to the pilot and/or passengers or the aircraft itself. The clearance requirements state that a clear zone must exist parallel to the airfield extending 1,000 feet from the edge of the primary surface of the runway. This clear area must be at grade with the runway or lower with no slopes greater than 10%. It is suggested that the slopes be as gradual as possible. Beyond the 1,000-foot clear area, the ratio for grade elevation is 7 to 1 (i.e., the grade may rise 1 foot vertically for every 7 feet of horizontal distance). Navigational/ meteorological equipment or other equipment deemed essential to the airfield may be permissible in the clear zone, but all other fixed structures are not allowed in this area.

The BASH program is outlined in the following document: *482 FW Plan 91-212, 482d Fighter Wing Bird-Aircraft Strike Hazard Reduction (BASH) Program* (482nd Fighter Wing 1999). The purpose of this program is to provide for the reduction of aircraft exposure to bird strikes by controlling bird populations that could endanger the aircraft at HARB. This program is key to the safety of pilots due to the large number of resident and migratory bird populations in the Homestead area. The basis of this plan is to observe potential problem bird activities, alert pilots, and use methods to disperse the birds. If necessary, operations may be limited or suspended until the hazard has dispersed.

While the grounds maintenance (mowing and spraying) acts as a clear zone and bird deterrent methodology, other, more assertive, dispersal methods are utilized as well. A contractor known as the "birdman" uses devices such as bioacoustics and pyrotechnics to scare off bird populations along the airfield if they are deemed a possible hazard. Flight operations are also geared in a way that minimizes the chance of a bird strike. Non-avian animals such as mammals and reptiles can pose a problem if they are crossing the runway. These are not as common an occurrence, but must be recognized and looked for when flight operations are ongoing.

5.3 Future Management Recommendations

New ideas or programs could be incorporated into the management of the wetlands on HARB that would enhance the ecology of the area while continuing to meet the clear zone and safety requirements for the airfield. A partial listing of some of these programs follows:

- Maintenance of wetlands areas to remove/control invasive/exotic species.
- Strategic planting of native species to increase the ecological value of the property.
- Modifications to the current management techniques to make them more ecologically friendly.

- Improvement and increase in maintenance of culverts and canals throughout the area to optimize hydrological connections.

- Analysis of the current drainage patterns of the area to determine efficiency of the system and consider improvements for optimization of the wetlands as an ecological system.

As in most of south Florida, there are many endemic exotic species in and around the wetlands of HARB, most notably Australian pine (*Casurina* spp.), cattail (*Typha* spp.) and Brazilian pepper (*Schinus terebinthifolius*). These plant species can grow in dense stands, and the Australian pine grows tall, as well. Removal of these species and restoration of the wetlands to a marsh-type habitat with native plantings would allow for greater ecological function, as well as eliminating tall obstructions within the clear zone. Additionally, periodic maintenance would be required to eliminate any future exotic growth from seed banks and/or imported seeds. By maintaining a marsh habitat with no canopy trees or tall vegetation, aerial spraying of herbicide could be replaced with selective spraying and/or removal of problem or exotic vegetation. Control of the types of species within the wetland areas would also lead to an enhancement of the overall system.

The current management techniques leave obvious signs of disturbance and degradation throughout the HARB wetlands. Tire ruts from mowing machines, and wide swaths of browning vegetation from herbicide spraying were observed during site visits. These impacts can be lessened, or even eliminated, by modifications to the system and program. Control of exotics within areas unreachable by mowing machines could lead to less frequency and greater localization of aerial spraying. Furthermore, changes to the mowing equipment (i.e., lighter mowers, different tires, etc.) should be examined.

Improved and/or increased maintenance of the system of culverts and canals throughout the wetlands areas could lead to an enhancement of the system, while improving control of storm water runoff from the airfield. An analysis of the current on-site drainage patterns could reveal the efficiency of the culverts and canals and how best to optimize their performance, while optimizing the hydrology of the wetlands. Furthermore, isolated wetlands on the Base also could be connected to the larger wetland area to the south through optimization of the canal/culvert system. This would increase ecological connectivity, and better drainage of storm water runoff to the larger wetland area could possibly enhance the water quality of the runoff. Increasing swales, retention areas, and drainage basins also could lead to an enhancement of the water quality of the wetlands.

Finally, additional management procedures also could be developed by working in cooperation with federal, state, and local governmental agencies to develop ways all parties involved can help and benefit from proper, efficient management of the Base wetlands.

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Statement of Work for Grounds Maintenance of the Cantonment and Munitions Area

PERFORMANCE WORK STATEMENT

FOR

GROUNDS MAINTENANCE

OF

THE CANTONMENT AND MUNITIONS AREA

AT

HOMESTEAD AIR RESERVE BASE, FLORIDA

Homestead ARB, FL
11 May 2007

PERFORMANCE WORK STATEMENT
GROUNDS MAINTENANCE
CANTONMENT AND MUNITIONS AREA

1. DESCRIPTION OF SERVICES. The contractor shall provide all labor, tools, transportation, material, equipment and supervision necessary to perform base grounds maintenance to present a clean, neat and professional appearance at Homestead Air Reserve Base in accordance with all applicable laws, regulations, standards, instructions and commercial practices as described in this Performance Work Statement (PWS). The estimated quantities of work are listed in Appendix A, titled Workload Estimates. The contractor shall provide grounds maintenance to the Homestead ARB Cantonment and Munitions areas (facilities, roads, shoulders, walks, drives, shrubs, hedges, etc.). Areas **excluded** from this contract are the Homestead ARB airfield, designated wetlands and the ordinance area. Any questions concerning grounds maintenance of the Cantonment and Munitions areas during the life of the contract shall be addressed through the Quality Assurance Evaluator (QAE) to the Contracting Officer. The types of services that will be provided include the following:

- Mow and trim grass and remove grass clippings (improved grounds)
- Edge
- Maintain/prune shrubs, hedges, and perennial flowers
- Maintain shrub beds
- Maintain drainage ditches

1.1. MAINTAIN IMPROVED GROUNDS. Grass cutting shall be accomplished on **approximately 408 acres** of improved grounds as indicated at Appendix A. The improved grounds include all grassed areas, ditches, flower beds and all other areas extending to the middle of roads, surrounding blocks, building walls, and all areas up to and including the perimeter fence. Grass clippings shall be removed or mulched. Contractor shall sweep or machine blow clippings from walks, drives, streets, etc., the same day grass is mowed. Contractor shall take precautions to prevent scalping, uneven mowing, and damage to trees, shrubs and sprinkler heads. The contractor shall repair damaged turf and replace flowers, shrubs, trees and sprinkler heads damaged during mowing operations at his expense. The following areas compose the improved grounds:

1.1.1. Cantonment areas consist of **approximately 288 acres** of improved grounds. This includes road shoulders, drives, walks, canal banks, etc. Contractor shall **maintain** grounds at a growth height between two (2) to four (4) inches, except for the area around taxiway "B", as indicated in Attachment # 5 (Map Area Layout). Taxiway "B" as defined in Appendix B shall be maintained at a height between seven (7) to fourteen (14) inches.

1.1.2. Grass shall be mowed from the Cantonment area fence (ornamental and chain link) to the edge of Bouganville Road.

1.1.3. Munitions storage area consists of **approximately 120 acres** of improved grounds. This includes berms that have an incline of approximately 42 degrees. Contractor shall **maintain** grounds at a height of between two (2) to four (4) inches.

1.2. MOW AND TRIM GRASS AND REMOVE GRASS CLIPPINGS. Grass shall be mowed in the areas specified on the map in Attachment # 5 using commercial methods as required to maintain the grass height specified in paragraph 1.1.1. Grass/weeds shall be trimmed around trees, shrubs,

buildings, fences, guy wires, utility covers, poles, posts, canals, ditches, fire hydrants, parking lot bumper blocks, boulders, culvert headwalls curbing, and other fixed obstacles not accessible to lawn mowers. Trimming shall be accomplished as required to match surrounding area. All mowed areas shall be trimmed at the same time that mowing is accomplished.

1.2.1. All perimeter and interior chain link fences shall be cleared of vegetation.

1.2.2. All pavements (i.e. asphalt, concrete or compacted fill at "Fire Training Facility") shall be maintained and kept free of grass. The contractor is authorized to apply herbicides on these areas.

1.2.3. Canals containing water shall be cut six (6) to twelve (12) inches above the water line with weed eater. Canals that are dry (no water) shall be cut at a height of no higher than three (3) inches.

1.3. EDGE. Sidewalks, edge of roads, driveways, curbs, and other concrete or asphalt edges located in the improved grounds areas shall be mechanically edged every other mowing. Grass shall be edged around all roads, bike paths and walkways and shall not extend more than two (2) inches over the edges. Edging shall include removal of vegetation from cracks in sidewalks, driveways, and curbs.

1.3.1. The contractor is authorized to apply herbicides on sidewalks, pavements, gutter cracks, around fuel storage tanks, compacted fill at the Aircraft Fire Training Facility (AFTF), and along perimeter and interior fences only. Contractor must notify the QAE when herbicides are to be used. Chemical edging of shrub beds, pavement edges, trees and hedges is not authorized for use by the contractor. These areas will need to be mechanically edged. Chemicals used on base are to be pre-mixed prior to bringing on base.

1.3.2. No chemicals are to be mixed on base. Contractor is to provide the types, concentrations and usage of herbicides on base to the QAE. **No cleaning of herbicide application equipment is authorized to be performed on base.**

1.4. MAINTAIN DRAINAGE DITCHES. Drainage 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. MAINTAIN/PRUNE SHRUBS, HEDGES AND PERENNIAL FLOWERS. Shrubs shall be pruned as requested by the Contracting Officer or QAE to maintain their natural growth characteristics. Minimum clearances from buildings, utilities and other obstructions shall be six (6) inches. Weeding shall be performed around shrubs and flowers using mechanical or manual commercial methods to prevent proliferation of weeds. Remove all dead foliage.

1.5.1. Hedges shall be maintained at their natural mature height and shape. No informal hedges shall be converted to formal shapes.

1.5.2. Clippings shall be removed and disposed of upon completion of work.

1.6. ENVIRONMENTALLY RESTRICTED AREAS. OU-12 and OU-15 restricted areas are identified in the map in Attachment # 5. Mowing frequency in these areas shall not be greater than once every two (2) weeks or as otherwise indicated by the Contracting Officer's Representative.

1.7. SERVICE SCHEDULE. The Contractor shall develop and maintain a service schedule for each area, to achieve the performance standards as identified. The service schedule should indicate the task and frequencies of performance for each area identified. The Contractor shall maintain and

provide accurate schedules for performing all of the tasks identified in this SOW. Contractor shall adjust frequencies of mowing/trimming to seasonal changes (rain, temperatures, etc.) so as to maintain the required grass height as specified in paragraphs 1.1.1 and 1.1.3. The schedule shall be coordinated with the QAE. A copy of the service schedule will be provided to the Contracting Officer and the QAE.

1.8. "AS REQUIRED" SERVICES. Contractor shall respond to special requests for grounds maintenance, as directed by the Contracting Officer or QAE. Requests may necessitate a change in schedule and/or additional maintenance. The additional grounds maintenance shall be performed in accordance with specifications set forth in this Performance Work Statement. Payment will be computed utilizing the fully burdened hourly rates and material costs contained in the bid schedule.

1.8.1. Work to be performed on an "as required" basis includes, but is not limited to the OU-18 area (Former Landfill) and areas outside the perimeter fence.

1.9. ADDITIONAL REQUIREMENTS: (Applicable to all items)

1.9.1. 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.

1.9.2. The Contractor shall provide the Contracting Officer a copy of the disposal tickets or coupons for all debris removed from the base.

1.9.3. All major equipment maintenance will be performed off the base. Space is not available on base for storage of contractor's equipment and tools.

2. SERVICE DELIVERY SUMMARY (SDS)

SOW Para	Performance Objective	Performance Threshold	Surveillance Method
1.1. and all sub-paragraphs	Maintain Improved Grounds	408 acres of improved grounds maintained at the required grass height. This objective shall be provided with no more than four (4) customer complaints per month.	Customer Complaint and Periodic Checks
1.2. and all sub-paragraphs	Mow and Trim Grass and Remove Grass Clippings	All areas should be maintained IAW requirements. Trim to same height as surrounding grass. This objective shall be provided with no more than four (4) customer complaints per month.	Customer Complaint and Periodic Checks
1.3. and all sub-paragraphs	Edge	No grass on hard surfaces. This objective shall be provided with no more than four (4) customer complaints per month.	Customer Complaint and Periodic Checks
1.4.	Maintain Drainage Ditches	Not to exceed height of surrounding vegetation and maintain free flowing water. This objective shall be provided with no more than four (4) customer complaints per month.	Customer Complaint and Periodic Checks

1.5. and all sub-paragraphs	Maintain/Prune Shrubs. Hedges and Perennial Flowers	Maintained IAW commercial methods and as requested by QAE. This objective shall be provided with no more than four (4) customer complaints per month.	Customer Complaint and Periodic Checks
1.8.	"As Required" Services	Responds to special requests for grass cutting/trimming as directed by the Contracting Officer or QAE. No violations allowed per occurrence.	100% Inspection

3. GOVERNMENT FURNISHED PROPERTY AND SERVICES. See Appendix B.

4. GENERAL INFORMATION.

4.1. CONTRACTOR MANAGER. The contractor shall identify to the Contracting Officer and QAE, the individual who will be responsible for the performance of the work. The name of this person and an alternate or alternates who shall act for the contractor when the manager is absent shall be designated in writing 15 calendar days prior to the contract start date. The Contractor shall provide to the Contracting Officer and QAE, the names and phone/pager numbers of the contract manager and alternate(s) for normal operating hours and for after business hours including nights, weekends, and holidays. This information will be kept updated by the Contractor whenever personnel changes occur.

4.1.1. The contract manager or alternate shall have full authority to act for the contractor on all contract matters relating to daily operation of this contract.

4.1.2. The contract manager or alternate shall be available during normal duty hours within one (1) hour to meet on the installation with government personnel (designated by the Contracting Officer) to discuss problem areas.

4.1.3. The contract manager and alternate or alternates shall be able to read, write, speak, and understand the English language.

4.2. CONTRACTOR PERSONNEL. The contractor shall not employ persons for work on this contract if such employee is identified to the contractor by the contracting officer as a potential threat to the health, safety, security, general well being, or operational mission of the installation and its population. Where reading, understanding, and discussing safety and environmental warnings are an integral part of a contract employee's duties, that employee shall be able to understand, read, write, and speak English.

4.2.1. Contractor personnel shall present a neat appearance and be easily recognized as contractor employees. The contractor employees will be issued an identification badge from the 482nd Support Group, Security Forces Division. The badge shall include the employee's name, employee's photograph, and contractor's name. Identification shall be available prior to employment and shall be worn or attached to the outer garment at all times.

4.2.2. Safety Equipment. Contractor will provide all necessary safety equipment (i.e. goggles, ear protection, etc.) to all his employees when doing their job.

4.2.3. 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*.

4.2.4. The contractor is cautioned that off-duty active military personnel hired under this contract may be subject to permanent change of station, change in duty hours, or deployment. Military Reservists and National Guard members may be subject to recall to active duty. The abrupt absence of these personnel could adversely affect the contractor's ability to perform; however, their absence at any time shall not constitute an excuse for non-performance under this contract.

4.3. SECURITY REQUIREMENTS. All personnel employed by the contractor in the performance of this contract, or any representative of the contractor entering the government installation, shall abide by all security regulations of the installation. The Contractor shall provide a letter with all personnel that will be performing services on Homestead ARB, FL to the Contracting Officer 15 calendar days prior to beginning work. The contents of the letter must contain each individual's full name, social security number, and a copy of their driver's license and worker's identification. This letter will be taken to the 482nd Support Group, Security Forces Division, Operations Section. Bldg 353, for authentication. This list shall be updated as new employees are added to the Contractor's work force.

4.3.1. The contractor shall ensure each employee obtains the pass and identification items as applicable for contractor personnel and non-government owned vehicles. Forms are issued by the Security Forces Pass and Identification office located in Building 353.

4.3.2. Controlled Area Access. The Contractor will arrange for escort through coordination with the QAE. This can be a one-time procedure; afterwards, the Contractor can make arrangements with the controlled area owner-user.

4.4. EMPLOYEE TRAINING: Contractor shall instruct his employees in the use of riding mowers, weed eaters, edger operations, and other grounds maintenance equipment, and in the use of personal protective equipment (i.e. industrial goggles and ear protection).

4.4.1. The contractor shall ensure employees are properly trained and qualified to safely operate grounds maintenance equipment before assigning employees to tasks that require use of the equipment. The contractor shall maintain records of each individual's training and certifications.

4.4.2. The contractor shall provide environmental, health, and safety training to ensure compliance with all federal, state, and local laws or regulations.

4.5. SPECIAL QUALIFICATIONS. The contractor shall obtain all required licenses/certifications by the state of Florida and federal agencies for supervision and application of herbicides/pesticides. Copies of these licenses/certifications shall be provided to the Contracting Officer prior to commencing work (Reference: 40 CFR 171.9 and Florida Statues Chapter 482 Pest Control).

4.6. PERFORMANCE OF SERVICES DURING CRISIS DECLARED BY THE NATIONAL COMMAND AUTHORITY OR OVERSEAS COMBATANT COMMANDER. Upon notification by the Contracting Officer, the Contractor shall perform services (Contingencies,

Operational Readiness Exercises or Inspections, Facility operations on an extended basis, etc.) as required. Emergency services will be priced separately from routine services. Pricing will be negotiated between the Contractor and the Contracting Officer per occurrence.

4.7. CONTRACTOR'S QUALITY CONTROL. The Contractor shall employ his commercial Quality Control program/procedures to identify, prevent and ensure non-recurrence of defective services. Through implementation of the Contractor's Quality Control program/procedures, the government will receive quality services meeting the requirements of this contract. The Contractor shall submit a copy of his Quality Control plan to the Contracting Officer 15 calendar days prior to start of contract performance.

4.8. HOURS OF OPERATION. The contractor shall perform the services required under this contract during the following hours:

4.8.1. Normal Operations. Cantonment Area: Normal Operation is Monday through Friday, 0730 - 1630 hours, except for Federal holidays. **Munitions Storage Area:** Normal operation is Monday through Friday, 0700 - 1430 hours, except for Federal holidays. Contractor is permitted to work until sundown and on weekends with prior approval from the using agency. Parking lot areas on base may be mowed and trimmed on weekends with prior approval from the QAE.

4.8.2. Federal Holidays. The following is a list of Federal Holidays observed by this installation:

New Year's Day, January 1 or the Friday preceding or Monday following
Martin Luther King's Birthday, 3rd Monday in January
President's Day, 3rd Monday in February
Memorial Day, Last Monday in May
Independence Day, July 4 or the Friday preceding or Monday following
Labor Day, First Monday in September
Columbus Day, 2nd Monday in October
Veterans Day, November 11 or the Friday preceding or Monday following
Thanksgiving Day, 4th Thursday in November
Christmas Day, December 25 or the Friday preceding or Monday following

4.9. CONSERVATION OF UTILITIES. The contractor shall make sure employees practice utilities conservation. The contractor shall operate under conditions that prevent the waste of utilities to include turning off water faucets or valves when not in use. In addition, the Contractor will adhere to county and SFWMD watering restrcitions during drought conditions.

4.10. ENVIRONMENTAL CONTROLS.

4.10.1. Compliance with Laws and Regulations. The contractor shall be knowledgeable of and shall comply with all applicable federal, state, and local laws, permits, DoD, Air Force, and base environmental requirements and instructions. The contractor shall ensure policies and procedures are established that protect the health and safety of employees and the community to minimize or eliminate the risk of environmental pollution.

4.10.2. Notification of Environmental Spills. In the event that the Contractor spills or releases any unallowable substance or hazardous waste (listed in 40 CFR 302) into the environment, the Contractor shall immediately report the incident to the Fire Department at (305) 224-7117. This phone number is available seven days a week. The Contractor shall be liable for the costs of

clean up and remediation of any spills or the release of such substance into the environment.

4.10.3. The contractor is responsible for advising his employees of all Environmental and Hazardous Materials Handling and is also required to have and maintain Material Safety Data Sheets (MSDS) for all materials used by the contractor in accordance with federal and state laws and/or regulations. (Reference AFI 91-301, *Air Force Occupational and Environmental Safety, Fire Prevention and Health (AFOSH) Program* and Occupational Safety and Health Administration (OSHA) requirements).

4.10.4. Occupational Safety and Health. The Contractor is responsible for the health and well being of his employees and ensuring compliance with all occupational safety and health laws to include 29 CFR 1910.1200, Hazard Communication and AFOSH Standard 161-21. A list of all hazardous material to be brought onto this installation will be submitted to 482 MSG/CEV, Environmental Engineering, along with a copy of the MSDS, 10 calendar days prior to the Contractor starting work.

4.11. ENVIRONMENTAL CONSIDERATIONS. All waste materials generated by any work under the contract performed on a government installation shall be handled, transported, stored and disposed of by the contractor and by his subcontractors at any time in accordance with all applicable Federal, state, or local laws, ordinances, regulations, court orders, or other types of rules or rulings having the effect of the law, including, but not limited to: Executive Order 12-088, 13 October 1978; the Federal Water Pollution Control Act, as amended (33 USC Sec 1251 ET SEQ); the Clean Air Act as amended (42 USC Sec 1857 ET SEQ); the Endangered Species Act, as amended (16 UDC Sec 1531, ET SEQ); the Toxic Substances Control Act, as amended (15 USC Sec 2601, ET SEQ); the National Historic Preservation Act, as amended (16 USC Sec 470, ET SEQ); the Solid Waste Disposal Act, as amended (42 USC Sec 6901 ET SEQ); and the Archaeological and Historic Preservation Act, as amended (16 USC Sec 469, ET SEQ). All hazardous materials transported into the base shall be handled and stored in a safe and secure manner to minimize the potential for spills or releases. There are no facilities on base to neither store nor mix chemicals or protective facilities such as emergency eyewash or showers to protect personnel in the event of contact with hazardous materials. In the event the Contractor causes a reportable release of hazardous waste, the Contractor shall reimburse the Government for any and all cost associated with the required clean up and disposal operations, as well as all consequential damages to personnel, property and the environment thereby related.

4.12. FIRE PREVENTION AND PROTECTION. The contractor and his employees shall comply with Homestead Air Base Station Regulation AFI 91-301, Fire Protection, Prevention and Enforcement, Sep 97. Base fire prevention personnel may make periodic routine inspections for regulation compliance. Burning of any material on base by the contractor is prohibited.

4.13. POLLUTION ABATEMENT. The Contractor shall perform all work in accordance with federal, state and local environmental regulations, (including maintenance of Material Safety Data Sheets (MSDS) IAW applicable EPA regulations and criteria so as to minimize pollution, exploitation and degradation of natural resources). In addition, the following requirements shall be mandatory.

4.13.1. Transporting debris or policed materials from the site shall be accomplished in a manner preventing particles from becoming airborne, such as covered vehicles or enclosed dumpster boxes.

4.13.2. Burning of any material by the Contractor is prohibited.

4.13.3. Stream beds, lakes, drainage ways, sanitary and storm sewers, etc. shall not be polluted by fuels, acids, pesticides or other harmful materials. If any of these materials are inadvertently spilled into these areas, the Contractor shall immediately notify the QAE, or Fire Department, 224-7114 or 224-7117, if QAE is unavailable.

4.13.4. The Contractor shall ensure that his operations do not expose any personnel to any hazardous conditions (i.e. noise, chemicals, etc.) as covered by OSHA/AFOSH Standards.

5. CONTRACTOR FURNISHED ITEMS AND SERVICES. See Appendix C. Except for those items or services specifically stated on Appendix B as Government furnished, the Contractor shall furnish everything needed to perform this contract according to all its terms and conditions.

APPENDIX A

WORKLOAD ESTIMATES

The contractor shall provide grounds maintenance for areas identified in Appendix B.

Figures represent the Government's best estimates and the Government assumes no liability in the event actual requirements do not equal the quoted estimate.

ITEM	NAME	UNIT	ESTIMATED QTY
1	Improved Grounds, Cantonment Area	Acres	288 *
2	Improved Grounds, Munitions Storage Area	Acres	120 *
3	"As Required" Labor	Hours	3,600
4	Chain Link Fence	LF	12,500
5	Cypress mulch (2 CF bags)	EA	5,000
6	Top Soil	CY	80
7	Fertilizer (60 Lbs. bags)	EA	60
9	Weed Killer	Gallons	40
10	Grass	SF	1,200
11	Concrete Edge Stone	LF	1,000

* Estimated acreage includes facilities and pavements.

APPENDIX B

GOVERNMENT-FURNISHED PROPERTY AND SERVICES

1. **GENERAL INFORMATION.** The government shall provide without cost, the services listed below.

2. **GOVERNMENT-FURNISHED FACILITIES/AREAS.** Government-Furnished Facilities are not furnished to the Contractor in this contract.

3. **GOVERNMENT-FURNISHED EQUIPMENT AND MATERIALS.** None.

4. **SECURITY POLICE AND FIRE PROTECTION.** The government will provide general on base Security Police and Fire Protection service. Security Police phone number is (305) 224-7114. The Fire Department phone number is (305) 224-7117. There are no 911 services on base.

5. **MEDICAL.** In the event of a severe emergency, the Fire Department Rescue Unit will respond to initial call. If they determine employee(s) need to be transported to a local hospital, they will notify Metro-Dade Rescue Unit. The Contractor shall reimburse Miami-Dade County Rescue for these services.

APPENDIX C

CONTRACTOR-FURNISHED ITEMS AND SERVICES

1. GENERAL INFORMATION. Except for those items or services specifically stated in section C-3 as government furnished, the contractor shall furnish everything needed to perform this contract according to all its terms. The following mentioned requirements are not all inclusive of the contractor-furnished items and services required in the performance of this contract.

2. CONTRACTOR-FURNISHED COMMUNICATIONS. A local operating business telephone shall be maintained at all times. This telephone number shall be given to the Contracting Officer, QAE and Service Call desk at the pre-performance conference after the start of the contract. The contractor shall be responsible for all costs associated with telephones and pager systems throughout the term of the contract.

3. DEBRIS REMOVAL. All debris and policed items shall be hauled off of Homestead Air Reserve Base grounds on a daily basis and disposed of IAW applicable federal, state and local regulations. Items shall be transported in tarp covered or closed vehicles. Any materials dropped or blown off vehicles shall be immediately picked-up by the Contractor. All scrap material and debris shall be disposed of daily at a contractor selected disposal area. The Government shall assume no responsibility in the selection of the above mentioned disposal area.

4. CONTRACTOR-FURNISHED VEHICLES. The contractor shall provide and maintain contractor-owned or leased vehicles to meet the requirements of this contract. Any contractor vehicles used in the performance of this contract shall have the company name prominently displayed on both sides of the vehicle and be maintained clean to present a professional appearance.

4.2.1. All vehicles used in the performance of this contract shall be in operable condition and meet the local, state and federal safety requirements. Equipment such as pick-up trucks, which have catalytic converters, shall not be operated on improved or semi-improved grounds, which are covered with dry vegetation. Vehicles found to be unsafe or unable to function as designed shall be removed from the installation and replaced at contractor's expense. Vehicular repairs shall not be done on base. The contracting officer may inspect the contractor's vehicles at any time and direct the removal of any unsafe or non-functional vehicle from the installation.

4.2.2. All vehicles shall be registered, licensed, insured, and operated in accordance with base traffic regulations by a licensed driver.

5. CONTRACTOR FURNISHED EQUIPMENT AND TOOLS. The contractor's equipment, including, but not limited to mowers (push, riding and tractor), edgers, trimmers, etc., shall be of commercial quality, size, and type suitable for accomplishing the work specified. All electrical equipment used by the contractor shall meet all safety requirements of this contract and shall be UL approved. The contractor's equipment shall be in good condition and able to operate efficiently and safely. Equipment shall be maintained clean to present a neat, professional appearance. The contracting officer may inspect the contractor's equipment and/or tools at any time and direct the removal of any unsafe equipment/tools. These items shall be removed from the job by the contractor and replaced with satisfactory equipment.

APPENDIX D

DEFINITIONS

GENERAL DEFINITIONS:

1. DEFECTIVE SERVICE. A service output that does not meet the standard of performance specified in the contract for that service.

2. SERVICE DELIVERY SUMMARY (SDS). A listing of the service outputs under the contract that are to be evaluated by the QAE on a regular basis, the surveillance methods to be used for these outputs, and the performance requirement of the listed outputs.

3. QUALITY ASSURANCE EVALUATOR (QAE). The Quality Assurance Evaluator is the authorized representative of the Contracting Officer for the purpose of performing inspection and acceptance of the services rendered under the contract contemplated hereby. The Contractor will be notified in writing of the individual(s) appointed as QAE after award of contract.

TECHNICAL DEFINITIONS:

1. CONTROL VEGETATION. The removal, prevention and elimination of unwanted vegetation in improved areas.

2. CONTINGENCY OPERATIONS. Unanticipated increases or decreases in the level of service required.

3. CRACK GRASS. All vegetation and plant life that grows up in the joints and cracks, in all asphalt and concrete pavements, sidewalks, curbs, parking lots and terraces at Homestead ARB.

4. DECIDUOUS. Trees or shrubs that shed their leaves seasonally.

5. DEBRIS. Objects that are unsightly or present obstacles to mowing and other grounds maintenance operations. Any silt, sand, rocks, or soil deposited by wind, personnel, equipment, or water runoff on all sidewalks, roadways, and terraces. Wind and storm damage items.

6. EDGING. The cutting of overhanging vegetation away from the hard surface (curbs, sidewalks, driveways, etc.) to include actual depth penetration of soil.

7. GRASS. Botanical, any plant of the Gramineae family that is characterized by narrow leaves with parallel veins. The leaves are composed of blade, sheath, and ligule. The plants have jointed stems and fibrous roots and inconspicuous flowers usually arranged in spikelets.

8. GRASS MAINTENANCE. The cultural practices required to provide disease and pest free grasses having the desired appearance. This work includes, but is not limited to, mowing, fertilizing, irrigating, reporting of insects and disease, aerating, edging trimming, raking, policing, sweeping, and eliminating weeds.

9. GRASS/WEED TRIMMING. The cutting of grass and weeds in areas that is inaccessible to mowers due to obstacles.

10. HEDGE. A row of bushes, conifer trees, or trees planted close together forming a barrier or

boundary.

11. HERBICIDE. An agent used to destroy or inhibit plant growth.

12. IMMEDIATELY. Within one hour.

13. IMPROVED GROUNDS. Areas coded as such at Appendix B. Grounds on which intensive development and maintenance measures are performed. This category normally applies to areas within the built-up section of an installation, which contains lawns, landscaping, rock beds, plant beds, flower beds, parade grounds, and athletic facilities.

14. PERENNIAL FLOWER. A plant (including the roots) cultivated for its blossoms that lives more than one year. Includes bulbs, vines, ground covers and ornamental grass.

15. PESTICIDE. Any substance or mixture of substances, including biological control agents, that may prevent, destroy, repel, or mitigate pests and are specifically labeled for use by the U.S. Environmental Protection Agency (EPA).

16. PLANT BED. An area consisting of concentrated shrubs, broadleaf evergreens, flowers or deciduous or conifer trees. Plant beds may contain either rock, wood mulch, bark chips or peat moss at a 3" depth as a surface ground cover. Plant beds are normally surrounded by edging such as; steel, wood, concrete, brick, rubber, or moss rock.

17. POLICING GROUNDS. The pickup and disposal of litter, such as paper, bottles, cans, cardboard, plastic containers, rags, tree limbs, branches, twigs, broken glass, chunks of concrete, black top, sod, leaves, tumbleweeds, dead animals, paper and plastic hung in trees or fences, and other items identified by QAE(s) as trash and other debris.

18. PRUNE. The selective or discriminate removal of dead, dying, diseased, live interfacing, objectionable, and weak branches in a scientific manner.

19. REMOVAL. To transfer or move something from where it is to an acceptable area.

20. RESTRICTED AREA. Those areas, designated by the Commander, that require control of personnel for security reasons or equipment for protection of personnel and property.

21. SHRUB. A woody plant of relatively low height, distinguished from a tree by usually having several stems rather than a single trunk.

22. SPECIAL EVENTS. Any grounds maintenance service as defined by the contracting officer and ordered through issuance of a delivery order(s).

23. WEEDS. Any plant growing where it is not desired. Plants such as, but not limited to: clover, dandelions, purslane, chickweed, plantain, knotweed, black medic, and volunteer trees are also considered weeds. Grass in plant, rock, and shrub beds, cracks in sidewalks, streets, and parking lots is also a weed.

24. WIND AND STORM DAMAGE. Fallen trees, limbs, shrubs, and debris deposited on roads, streets, walks, improved, semi-improved, or unimproved grounds. Any blockage of storm drains or silt deposited by water runoff on sidewalks or roadways.

Appendix F

Fish and Wildlife/Threatened and Endangered Species Management Component Plan for the Integrated Natural Resources Management Plan

Homestead Air Reserve Base, Homestead, Florida

Executive Summary

ES.1 Type of Document

This document is a Fish and Wildlife/Threatened and Endangered Species Management Component Plan.

ES.2 Purpose of Document

The plan was originally developed for the United States Air Force Reserve Command (AFRC) as part of the 2004 revision of the Integrated Natural Resources Management Plan (INRMP) for Homestead Air Reserve Base (HARB; also referred to herein as the Base), Florida. In accordance with Air Force Instruction (AFI) 32-7064 (17 SEP 2004), "Integrated Natural Resources Management," the plan is written as a tool for the 482nd Fighter Wing/Mission Support Group/Environmental Flight (482 MSG/CEV) to develop, manage and maintain fish and wildlife habitat resources, including threatened and endangered species on HARB. The plan addresses the management of non-consumptive use of fish and wildlife resources of HARB and complements the operational requirements of the military mission. The plan also supports the overall goals and objectives of the INRMP.

ES.3 Objectives of the Plan

The goals and objectives for the management of fish and wildlife resources provided in this plan are the same objectives prepared in the 2004 INRMP. This component plan is prepared as an appendix to the 2004 INRMP. Implementation of conservation management initiatives and projects described in this plan also implement the goals and objectives of the INRMP.

The plan provides HARB with a guide to implementing a fish and wildlife management program to promote long-term conservation management that does not conflict with the primary military mission of the 482nd FW. The 482nd MSG/CEV will be the primary user of the plan. It also provides a reference of natural resource information useful in the planning of civil works and other planning and development projects at HARB. Examples of secondary users may include the HARB Environmental Protection Committee (EPC), bird/wildlife aircraft strike hazard (BASH) program

manager and the AFRC. This plan will form the baseline for existing conditions of fish and wildlife resources for use in the next five-year revision to the INRMP.

In the INRMP, HARB identified three broad-based ecosystem management goals for natural resources management. Objectives addressing the conservation of T/E species and vegetative communalities on HARB include (also see Volume I, INRMP, Section 4):

Objective 1.4 Reduce and control populations of invasive and exotic plant species to minimize conflicts with the military mission and to reduce adverse impacts to existing native communities.

Objective 2.1 Restore and protect the Remnant Pine Rockland to support native plant communities and associated wildlife, including threatened/endangered (T/E) species habitat.

Objective 2.2 Enhance and maintain the natural communities surrounding Phantom Lake to support native fish and wildlife species and provide for natural resources-based outdoor recreation for HARB personnel.

Objective 2.3 Enhance and maintain the natural communities surrounding Twin Lakes to support native fish and wildlife species and provide for natural resources-based outdoor recreation for the HARB personnel.

Objective 2.4 Protect and maintain known and potential burrowing owl habitat.

Objective 2.5 Enhance and maintain the Grenade Range and Reserves Area to support wildlife species in a manner that is compatible with the military mission.

Objective 2.6 Enhance and conserve the diversity of the native fish community within the Boundary Canal.

Objective 2.7 Conserve and protect the habitats for federal- and state-listed T/E species, and species of concern.

Objective 2.8 Institute controls for nuisance wildlife that may adversely affect the health of the ecosystem and/or the military mission.

ES.4 Land Management Units and Management Focuses

To achieve the objectives mentioned above, HARB has been divided into fourteen (14) land management units. These areas were established in the plan to acknowledge the use of each area for its military purpose and for considering the opportunities to achieve wildlife management objectives. Within this plan, some of the fourteen areas have been combined in accordance with geographical location and similar habitat communities. Within each of the areas, wildlife management focuses are identified. The focus of wildlife management within an area provides geographic emphasis for the primary management practices necessary to achieve the long-term goals and objectives of the INRMP.

The areas are as follows:

- Remnant Pine Rockland;
- Administrative and Industrial Support Area;
- Grenade Range and Reserves Area;
- Phantom Lake Area and Old Grenade Range;
- Southeast Triangle;
- Munitions Area;
- Northeast Grasslands;
- Hush House Area;
- Wetland Marsh;
- Southwest Clear Zone;
- Twin Lakes and Wetland Fringe;
- Airfield;
- Operable Unit-2; and
- Boundary Canal.

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Table of Contents

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List of Tables

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List of Illustrations

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List of Acronyms and Abbreviations

AFB	Air Force Base
AFI	Air Force Instruction
AFRC	Air Force Reserve Command
ARS	Air Reserve Station
ARB	Air Reserve Base
BASH	bird-aircraft strike hazard
BCE	Base Civil Engineer
DERM	Department of Environmental Resources Management
DoD	United States Department of Defense
EPC	Environmental Protection Committee
IESMP	Invasive and Exotic Species Management Plan
FNAI	Florida Natural Areas Inventory
FW/MSG/CEV	Fighter Wing/Mission Support Group / Environmental Flight
FY	fiscal year
GPS	Global Positioning System
HARB	Homestead Air Reserve Base
INRMP	Integrated Natural Resources Management Plan
PAO	Public Affairs Officer
PLESMP	Phantom Lake Area Exotic Species Management Plan
PRRMP	Pine Rockland Restoration and Management Plan
SFWMD	South Florida Water Management District
SOP	Sustainability Operations Plan
STESMP	Southeast Triangle Uplands Exotic Species Management Plan
USACE	United States Army Corps of Engineers
USAF	United States Air Force

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1 Introduction

1.1 Purpose of the Plan

This Fish and Wildlife/Threatened and Endangered Species Management Component Plan (the plan) has been developed for the United States Air Force Reserve Command (AFRC) as part of the 2004 revision of the Integrated Natural Resources Management Plan (INRMP) for Homestead Air Reserve Base (HARB; also referred to herein as the Base), Florida. In accordance with draft Air Force Instruction (AFI) 32-7064 (January 2002) "Integrated Natural Resources Management", the plan is written as a tool for the 482nd Fighter Wing/Support Group/Chief of Environmental Flight (FW/SPTG/CEV) to develop, manage, and maintain fish and wildlife habitat resources, including threatened and endangered (T/E) species on HARB. The plan describes fish and wildlife habitat resources within HARB and objectives for managing those resources. Included are the results of qualitative ecological field surveys performed to describe the distribution and condition of natural resources within HARB boundaries. Fish and wildlife/threatened and endangered species management objectives are provided, which are also addressed in the INRMP (Volume I, Section 4) to promote the conservation of natural resources at HARB through implementation of a year-round program. Specific management initiatives and projects are addressed for implementation over a five-year period (fiscal year [FY] 2003-08). Land use constraints due to military operational requirements, such as bird/wildlife aircraft strike hazard (BASH) reduction, explosive safety clear zones (ESCZs), and maintenance of airfield safety clearances (see Volume I, INRMP, Figure 2-3), as well as the natural resource management activities for each area are also addressed.

1.2 Use and Organization of the Plan

The plan provides HARB with a guide to implementing a fish and wildlife management program to promote long-term conservation management consistent with the primary military mission of the 482nd FW. The 482nd CEV will be the primary user of the plan. The plan also provides a

reference of natural resource information useful in the planning of civil works and other planning and development projects at HARB. Examples of secondary users may include the HARB Environmental Protection Committee (EPC), BASH program manager, and the AFRC. This plan will form the baseline for existing conditions of fish and wildlife resources for use in the next five-year revision to the INRMP.

The plan is organized as a user-friendly guide of information and management issues. Section 1 provides a discussion of the purpose and organization of the plan, description of the overall goals of the fish and wildlife program, and discusses the existing fish and wildlife program and the roles and responsibilities. Section 2 provides a general characterization of HARB land and provides a discussion of the survey methodology. Section 3 identifies fish and wildlife habitats on HARB and the goals and objectives for management of these resources within the constraints of military operational requirements. A schedule of projects relative to fish and wildlife management at HARB is provided in Appendix A of the INRMP (see Volume II). References used in the development of this plan are listed in Section 4.

1.3 Objectives

Objectives were developed as part of the preparation and development of the 2003 INRMP revision. Objectives addressing the conservation of T/E species and vegetative communalities on HARB include (also see Volume I, INRMP, Section 4):

Objective 1.4 Reduce and control populations of invasive and exotic plant species to minimize conflicts with the military mission and to reduce adverse impacts to existing native communities.

Objective 2.1 Restore and protect the Remnant Pine Rockland to support native plant communities and associated wildlife, including threatened/endangered (T/E) species habitat.

Objective 2.2 Enhance and maintain the natural communities surrounding Phantom Lake to support native fish and wildlife species and provide for natural resources-based outdoor recreation for HARB personnel.

Objective 2.3 Enhance and maintain the natural communities surrounding Twin Lakes to support native fish and wildlife species and provide for natural resources-based outdoor recreation for the HARB personnel.

Objective 2.4 Protect and maintain known and potential burrowing owl habitat.

Objective 2.5 Enhance and maintain the Grenade Range and Reserves Area to support wildlife species in a manner that is compatible with the military mission.

Objective 2.6 Enhance and conserve the diversity of the native fish community within the Boundary Canal.

Objective 2.7 Conserve and protect the habitats for federal- and state-listed T/E species, and species of concern.

Objective 2.8 Institute controls for nuisance wildlife that may adversely affect the health of the ecosystem and/or the military mission.

For additional goals, objectives, strategies, initiatives, and projects refer to Section 4 of the 2003 INRMP (see Volume I).

1.4 Program Implementation and Responsibilities

The fish and wildlife management plan was developed to meet the needs of HARB per the requirements of draft AFI 32-7064. Homestead ARB is owned by the 482nd FW of AFRC, and the 482nd FW is responsible for the implementation of this plan. Following are the responsibilities of the various offices of the 482nd FW as they relate to implementation of this plan:

- The **482nd CEV** is responsible for natural resources management and will implement the plan to conserve and manage fish and wildlife resources on HARB. The CEV is responsible for ensuring that implementation of the plan adheres to federal, state, local, and United States Air Force (USAF) environmental regulations and guidelines. The CEV is also responsible for coordination and oversight of the Base fishing program and no hunting policy.

- The **Base Civil Engineer (BCE)** is responsible for all maintenance, environmental, and construction activities at HARB. To ensure available funding and consistency with the Base comprehensive planning process, fish and wildlife management activities identified in the plan should be reviewed by the BCE.

- The **HARB Public Affairs Officer (PAO)** is responsible for the coordination of public access within HARB. HARB has a policy of providing unrestricted recreational use of some areas within the Base to the United States Department of Defense (DoD) community. The PAO will serve as the point of contact for recreational use of fish and wildlife habitat areas addressed in the plan.

- The **HARB Security Police** is responsible for providing the DoD community with information about which areas of the Base are available for public access and enforcement of the fishing and no hunting policies.

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2 Land Management Units and Survey Methodology

2.1 Land Management/Management Units

The 2003 INRMP identifies fourteen land management units underlying the broader mission-driven land uses on HARB. These broader units include the airfield, the ammunition storage area, and safety buffers associated with the ESCZ arcs, and the urban/industrialized area. The mission requirements of the broader land use categories present both opportunities and constraints for the management of vegetation and wildlife for compatible with the military mission. Within this plan, some of the fourteen areas have been combined in accordance with geographical location and similar habitat communities. Land management units are used, in part, to provide the user of this plan with geographic reference points for conducting management activities (see Figure 2-1). The units and acreages are identified below:

- Boundary Canal: 40,400 linear feet;
- Administrative and Industrial Support: 334.3 acres;
- Airfield area: 945.3 acres;
- Grenade Range and Reserves area: 116.6 acres;
- Hush House area: 30.6 acres;
- Munitions area: 122.0 acres;
- Northeast Grasslands: 50.5 acres;
- Operable Unit (OU)-2 area: 21.1 acres;
- Phantom Lake, including the Old Grenade Range: 93.8 acres;
- Remnant Pine Rockland: 5.1 acres;

- Southeast Triangle: 51.9 acres;
- Southwest Clear Zone: 57.0 acres;
- Twin Lakes and Wetland Fringe: 40.8 acres; and
- Wetland Marsh: 34.7 acres.

2.2 Survey Methodology

Field surveys were conducted on HARB in order to collect data on the existing natural resources and to assess the current condition of the natural habitats within the Base's boundaries. Prior to conducting field surveys, Base documents were reviewed including the current Integrated Natural Resource Management Plan (1996), Fish and Wildlife Management Plan (1997), and the Threatened and Endangered Species Survey (1997). Existing and historical maps and aerial photographs of the Base were reviewed during the development of this component plan. Specific land management units to be surveyed were identified based on existing habitats, potential for restoration, or potential for the presence of native, exotic, and threatened and endangered species.

Prior to the identification of specific survey plots, preliminary surveys were conducted of each of the land management units to assess their size, vegetation diversity, and habitat quality. Completion of this assessment determined the number and location of plots to be surveyed within each land management unit. As indicated by the survey plots illustrated on Figure 2-1, some land management units were not sampled because of the presence of a monoculture or the lack of quality habitat. Survey plots were selected that would provide a representative sampling of both the habitat and vegetation within each land management unit.

Survey plots were marked by flagging a center point and measuring a 25-foot radius circle from the center point. The plot was marked with pin flags and a biologist surveyed each quadrant of the circle. Species lists for each plot were compiled and habitat assessments were conducted for the general surrounding environment. Data collected for each plot included: general site description; plant community; plant species list including exotics and threatened and endangered species; wildlife potential; wildlife signs or sightings; threatened and endangered species habitat potential; wildlife accessibility; and restoration potential. Each survey plot was recorded by hand on a Base map and notes were taken in a field notebook. The center point for each plot was entered into a Geographical Positioning System (GPS) unit and photographs were taken of each plot and surrounding habitats and vegetation (see Attachment A).

Plot identification codes were given to each plot that consists of a four-digit code identifying the date the plot was surveyed, a two-letter code descriptive of the location of the land management unit, and a two-digit code differentiating each plot at the site. For example, plot #1211PR02 would have been surveyed on December 11 (1211), on the pine rockland remnant (PR), and would be plot #2 at that site (02).

A total of 33 survey plots were surveyed and included the following locations (see Figure 2-1):

- **Remnant Pine Rockland** (plot ID# PR) – 3 plots in Pine Rockland located in the north west corner of the Base boundary.
- **Phantom Lake and Old Grenade Range** (plot ID# PL) – 10 plots around the Phantom Lake area in the western portion of the Base.
- **Grenade Range and Reserves area** (plot ID# GF) – 7 plots in the Grenade Range and Reserves Area containing the abandoned grenade field south of Phantom Lake.
- **Southwest Clear Zone** (plot ID# SW) – 2 plots in the Southwest Clear Zone located in the southwest corner of the Base.
- **Hush House area** (plot ID# HH) – 3 plots in the Hush House Area in the southern portion of Base.
- **Southeast Triangle** (plot ID# TR) – 3 plots in the Southeast Triangle located in the southeastern corner of the Base.
- **Airfield** (plot ID# MA) – 3 plots were located within the Airfield area of the Base where mowing occurs on a regular schedule.
- **Administrative and Industrial Support area** (plot ID# MA) – 2 plots were located within the Administrative and Support areas where mowing occurs on a regular schedule.

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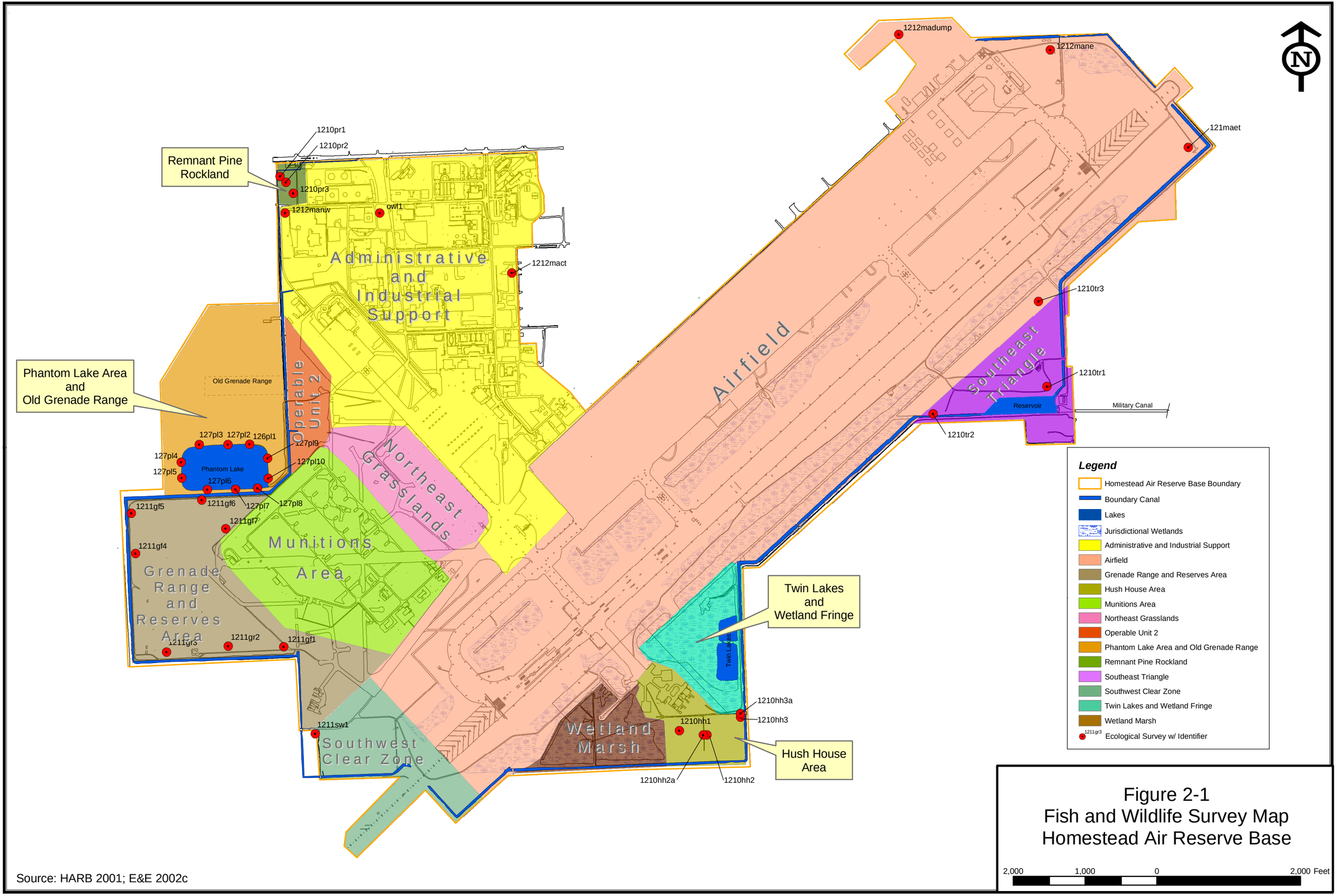
1212madump
1212mane
121maet
1210pr1
1210pr2
Remnant Pine Rockland
1210pr3
1212marw
owl1
1212mact
Administrative and Industrial Support
Airfield
1210tr3
Southeast Triangle
1210tr1
Reservoir
Military Canal
1210tr2
Phantom Lake Area and Old Grenade Range
Old Grenade Range
Operable Unit 2
127pl3
127pl2
126pl1
127pl9
127pl4
127pl10
127pl5
Phantom Lake
127pl6
127pl7
127pl8
1211gf6
1211gf5
1211gf7
1211gf4
Northeast Grasslands
Munitions Area
Grenade Range and Reserves Area
1211gr3
1211gr2
1211gf1
Twin Lakes and Wetland Fringe
Twin Lakes
1210hh3a
1210hh3
1210hh1
Wetland Marsh
Hush House Area
1211sw1
Southwest Clear Zone
1210hh2a
1210hh2
Legend
Homestead Air Reserve Base Boundary
Boundary Canal
Lakes
Jurisdictional Wetlands
Administrative and Industrial Support
Airfield
Grenade Range and Reserves Area
Hush House Area
Munitions Area
Northeast Grasslands
Operable Unit 2
Phantom Lake Area and Old Grenade Range
Remnant Pine Rockland
Southeast Triangle
Southwest Clear Zone
Twin Lakes and Wetland Fringe
Wetland Marsh
1211gr3 Ecological Survey w/ Identifier
Source: HARB 2001; E&E 2002c
Figure 2-1
Fish and Wildlife Survey Map
Homestead Air Reserve Base
2,000
1,000
0
2,000 Feet

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3 Fish and Wildlife Habitat Management

This section provides descriptions of vegetation, wildlife/habitat, and provides recommended management actions (objectives, strategies, projects, and initiatives) by land management unit, consistent with the goals and objectives provided in Section 4 of the INRMP (see Volume I). As mentioned previously, some of these land management units have been combined or may not have been addressed due to the presence of monotypical habitats (i.e., invasive exotic species) or the lack of habitat. Collectively, the Administrative and Industrial Support area and the OU-2 area contain primarily improved land and little natural habitat. Results of survey points taken in the maintained and mowed areas of the Administrative and Industrial Support area (1212MANW and 1212MACT) showed one or all of the grass species Bermuda, Bahia, and St. Augustine grass. The unmaintained areas surrounding these plots contained exotic species such as Brazilian pepper, Napier grass, Australian pine, and Burma reed. Because of a lack of habitat for management, these areas are not addressed in detail in this report; however, the Base-wide management objectives discussed in Section 3.10 are recommended for implementation in these areas. Management of these areas is addressed in detail in Sections 5.2 and 5.8 of the INMRP (see Volume I).

3.1 Remnant Pine Rockland

Vegetation Assessment

A remnant pine rockland community is located in the northwest corner of HARB, between the West Boundary Canal on the west and the Fuel Farm on the east. This pine rockland is comprised of approximately 5.1 acres. Three plots were surveyed in this land management unit (see Figure 2-2; photographs of these survey plots are located in Attachment A). Soils consist of a thin layer of sand over Oolitic limestone that is frequently exposed at the surface. The pine rockland community was largely destroyed as a result of Hurricane Andrew. The area received heavy damages from the storm that resulted from both the immediate damage to the canopy from strong sustained winds and delayed

pine mortality due to insect pests that infected the weakened remaining trees (Miami-Dade County Department of Environmental Resources Management [DERM] 1995).

Currently, the area contains an open canopy with a heavy understory of mostly herbaceous species. Many native Florida species, as well as many species associated specifically with pine rockland community types, occur here, including several Florida slash pine (*Pinus elliotii*) saplings (a keynote species in pine rocklands). The state-endangered locustberry (*Byrsonima lucida*), quail berry (*Crossopetalum ilicifolium*), rockland clustervine (*Jacquemontia curtissii*), and ground lantana (*Lantana depressa*) were all located within this community. Table 3-1 provides a list of plant species recorded on field survey plots in the pine rockland habitat at HARB.

The area also contains a small stand of Australian pine (*Casuarina equisetifolia*) and many Australian pine saplings were noted throughout the site. A dense stand of Burma reed (*Neyraudia reynaudiana*) and Napier grass (*Pennisetum purpureum*) is located 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 out-competing native species.

Table 3-1

HARB Remnant Pine Rockland Field Survey Plant Species List

Plot Identification	Plant species	Common name	Percent Cover	Florida Status	Federal Status	FNAI Rank	Other Status
1210PR01	*Albizia sp.*	Mimosa, silk tree	<5				
1210PR01	*Andropogon sp.*	Blue stem	<5				
1210PR01	*Borrichia frutescens*	Sea ox-eye daisey	<5				
1210PR01	*Byrsonima lucida*	Locustberry	<5	E		G3/S3	
1210PR01	*Casuarina equisetifolia*	Australian pine	<5				EPPC I
1210PR01	*Crossopetalum ilicifolium*	Quail berry	<5	E		G2/S2	
1210PR01	*Croton linearis*	Pineland croton	<5				
1210PR01	*Cuscuta gronovii*	Dodder, love vine	<5				
1210PR01	*Cynodon dactylon*	Bermuda grass	<5				
1210PR01	*Dipholis salicifolia*	Willow bustic	<5				
1210PR01	*Flaveria linearis*	Yellow top	<5				
1210PR01	*Guettardia scabra*	Velvet seed	<5				
1210PR01	*Metopium toxiferum*	Poisonwood	15				
1210PR01	*Hyptis alata (possibly)*	Musky Mint	<5				
1210PR01	*Lantana camara*	Shrub verbena	<5				EPPC 1
1210PR01	*Neyraudia reynaudiana*	Burma reed	10				EPPC 1

Table 3-1

HARB Remnant Pine Rockland Field Survey Plant Species List

Plot Identification	Plant species	Common name	Percent Cover	Florida Status	Federal Status	FNAI Rank	Other Status
1210PR01	*Pteris sp.*	Fern	<5				
1210PR01	*Rhoeo spathacea*	Oyster plant	<5				EPPC I
1210PR01	*Samolus ebracteatus*	Water pimpernel	<5				
1210PR01	*Setaria lutescens (or parviflora)*	Foxtail	<5				
1210PR01	*Smilax laurifolia*	Smilax, briar	<5				
1210PR01	*Stachytarphetta spp*	Porter weed	<5				
1210PR01	*Tetrazygia bicolor*	Tetrazygia	<5				
1210PR01	*Trema micranthum*	Florida trema	20				
1210PR02	*Albizia sp.*	Mimosa, silk tree	<5				
1210PR02	*Andropogon sp.*	Blue stem	<5				
1210PR02	*Anemia adiantifilia*	Pine fern	<5				
1210PR02	*Aster sp.*	Aster	<5				
1210PR02	*Borrichia frutescens*	Sea ox-eye daisey	<5				
1210PR02	*Byrsonima lucida*	Locustberry	<5	E		G3/S2	
1210PR02	*Coccoloba uvifera*	Sea grape	<5				
1210PR02	*Crotalaria pumila*	Rattlebox	<5				
1210PR02	*Croton linearis*	Pineland croton	<5				
1210PR02	*Dichromena floridensis*	White top sedge	<5				
1210PR02	*Eupatorium capillifolium*	Dog fennel	<5				
1210PR02	*Flaveria linearis*	Yellow top	<5				
1210PR02	*Metopium toxiferum*	Poisonwood	<5				
1210PR02	*Jaquemontia curtissii*	Pineland jaquemontia	10	E		G2/S2	
1210PR02	*Lantana camara*	Shrub verbena	<5				EPPC 1
1210PR02	*Lantana involucrata*	Wild sage	10				
1210PR02	*Morinda royoc*	Cheese plant	<5				
1210PR02	*Myrsine floridana*	Myrsine	<5				
1210PR02	*Neyraudia reynaudiana*	Burma reed	10				EPPC I
1210PR02	*Pennisetum purpureum*	Napier grass	10				EPPC I
1210PR02	*Poinsettia heterophylla*	Painted leaf poinsettia	<5				
1210PR02	*Pteridium aquilinum*	Braken fern	<5				

Table 3-1

HARB Remnant Pine Rockland Field Survey Plant Species List

Plot Identification	Plant species	Common name	Percent Cover	Florida Status	Federal Status	FNAI Rank	Other Status
1210PR02	*Pteris sp.*	Fern	<5				
1210PR02	*Randia aculeata*	Randia, Indigo berry	<5				
1210PR02	*Sabal minor*	Palmetto	<5				
1210PR02	*Sabal palmetto*	Cabbage palm	<5				
1210PR02	*Schinus terebinthifolius*	Brazilain pepper	<5				EPPC I
1210PR02	*Senna bicapsularis*	Butterfly bush	<5				
1210PR02	*Stachytarphetta spp*	Porter weed	15				
1210PR02	*Vitis rotundifolia*	Muscadine grape	<5				
1210PR03	*Aster sp.*	Aster	<5				
1210PR03	*Borrichia frutescens*	Sea ox-eye daisey	<5				
1210PR03	*Casuarina equisetifolia*	Australian pine	<5				EPPC I
1210PR03	*Croton linearis*	Pineland croton	10				
1210PR03	*Cynodon dactylon*	Bermuda grass	<5				
1210PR03	*Dichromena floridensis*	White top sedge	10				
1210PR03	*Flaveria linearis*	Yellow top	10				
1210PR03	*Guettardia scabra*	Velvet seed	<5				
1210PR03	*Lantana camara*	Shrub verbena	<5				EPPC 1
1210PR03	*Lantana depressa*	Ground lantana	<5	E		G2T2 OR G2T1	
1210PR03	*Neyraudia reynaudiana*	Burma reed	<5				EPPC I
1210PR03	*Pinus elliottii*	Slash pine	<5				
1210PR03	*Pteris sp.*	Fern	<5				
1210PR03	*Sabal palmetto*	Cabbage palm	<5				
1210PR03	*Smilax laurifolia*	Smilax, briar	<5				
1210PR03	*Stachytarphetta spp*	Porter weed	10				

Key:

Florida Status

E = Endangered: species or isolated population so few or depleted in number or so restricted in range that it is in eminent danger of extinction.

Table 3-1

HARB Remnant Pine Rockland Field Survey Plant Species List

Plot Identification	Plant species	Common name	Percent Cover	Florida Status	Federal Status	FNAI Rank	Other Status

Key (continued):

Florida Natural Areas Inventory (FNAI) Rank

S2 = Imperiled in Florida because of extreme rarity (6-20 occurrences of less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.

S3 = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.

G2 = Imperiled globally because of extreme rarity (6-20 occurrences of less than 3,000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.

G3 = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.

G5 = Demonstrably secure globally.

G#T# = Rank of taxonomic subgroup such as a subspecies or variety; the G portion of the rank refers to the entire species and the T portion refers to the specific subgroup; numbers have the same definition as above.

Other Status

EPPC I = Invasive exotics that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives. This definition does not rely on the economic severity or geographic range of the problem, but documented ecological damage caused.

EPPC II = Invasive exotics that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species. These species may become ranked Category I, if ecological damage is demonstrated.

Wildlife/Habitat Assessment

Wildlife observations within this habitat type consisted of only avian species including the mockingbird (*Mimus polyglottos*), osprey (*Pandion haliaetus*), double-crested cormorant (*Phalacrocorax sp.*) and red-bellied woodpecker (*Melanerpes carolinus*). All these species, except for the red-bellied woodpecker, were observed flying in the general area and would not be expected to use this area due to the availability of resources in other areas of the Base. However, the present condition of this pine rockland community provides only marginal habitat for this species.

FNAI describes pine rocklands as flatlands with exposed limestone substrate; mesic-xeric; subtropical; frequent fire dependent communities that contain south Florida slash pine (*Pinus elliotii*), palms and/or hardwoods, and mixed grasses and herbs (FNAI, 2002). Fire plays an important role in the evolution and succession of pine rockland communities and many of the native plants are dependent on frequent fires. FNAI uses a ranking system in order to identify and track exemplary or rare Florida habitats. Pine rockland communities are ranked as G1/S1 and are considered “critically imperiled” both globally and in Florida.

Management Recommendations

Damage from Hurricane Andrew and the exclusion of fire from this area over recent years have significantly altered this habitat. Fire management of the pine rockland to eliminate exotics and promote regeneration of a native species understory should be a priority (Maguire, 1995). While the

use of fire is not feasible due to the proximity of HARB's fuel tank farm and a motel adjacent to the Base's perimeter fencing next to the Remnant Pine Rockland area, mechanical reduction of the fuel load could benefit the natural environment and enhance safety features of the Base. Areas with dense Burma reed should receive a secondary treatment of herbicide application on new sprouts (Maguire *et al.,* 1994). Reforestation of canopy species may be considered once management of the native understory has been achieved.

Table 3-2 provides a listing of the fish and wildlife management objectives for the Remnant Pine Rockland area, as well as management strategies, projects, and initiatives. Additional, Base-wide management objectives applicable to this management unit are discussed in Section 3.10. A complete listing of all the goals, objectives, strategies, projects, and initiatives are provided in Section 4 of the INRMP (see Volume I).

Table 3-2

Remnant Pine Rockland Fish and Wildlife Conservation Management Objectives, Strategies, and Initiatives

Objective 2.1	Restore and protect the remnant Pine Rockland to support native plant communities and associated wildlife, including T/E species habitat.	
Strategy 2.1.1	Develop a Pine Rockland Restoration and Management Plan (PRRMP)	
Project:	*Project No. 5*: Pine Rockland Restoration and Management Plan. Will include an invasive and exotic species removal component plan. Cross Reference: *Project No. 4 – IESMP*.	
Initiatives	1)	Explore potential partnership opportunities with other entities involved in the restoration/enhancement of remnant Pine Rockland ecosystems in South Florida.
	2)	Promote stewardship of the native ecosystems within the Base among the HARB community.
	3)	Consider consultation with AFCEE, AFRC HQ, and the Miami-Dade County Department of Environmental Resources Management for plan development.
	4)	Evaluate the compatibility of restoration efforts with the BASH reduction objectives.

3.2 Phantom Lake and Old Grenade Range Area

Vegetation Assessment

Phantom Lake and Old Grenade Range Area (approximately 93.8 acres) is located in the western portion of HARB, east of the West Boundary Canal and north of the Grenade Range. A maintained access road encircles the lake. Ten plots were surveyed in this area (see Figure 2-2; photographs of these sites are located in Attachment A). Soils consist of a thin overlay of sand over

Oolitic limestone that is frequently exposed at the surface. The dominant species of vegetation include a dense border of Burma reed (*Neyraudia reynaudiana*), and several Australian pine (*Casuarina equisetifolia*) trees that thrive along the banks of the lake. Although these two species tend to form monocultures that exclude other species, the canopy remains open in many areas and allows for some growth of both 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 state-endangered locust berry (*Brysonima lucida*), parsley fern (*Sphenomeris clavata*), satin leaf (*Chrysophyllum oliveform*), rockland clustervine (*Jacquemontia curtissii*), and small-leaf melanthera (*Melanthera parviflora*) were recorded within the field survey plots for this community. Table 3-3 provides a list of plant species recorded in field survey plots at Phantom Lake and Old Grenade Range Area.

Table 3-3

HARB Phantom Lake and Old Grenade Range Area Plant Species List

Plot Identification	Plant Species	Common Name	Percent Cover	Florida Status	Federal Status	FNAI Rank	Other Status
1206PL01	*Andropogon sp.*	Blue stem	<5				
1206PL01	*Anemia adiantifolia*	Pine fern	<5				
1206PL01	*Ardisia eliptica*	Shoe button ardisia	<5				EPPC I
1206PL01	*Brysonima lucida*	Locustberry	<5	E		G3/S3	
1206PL01	*Casuarina equisetifolia*	Australian pine	<5				EPPC I
1206PL01	*Centella asiatica*	Hydrocotyl	<5				
1206PL01	*Cirsium sp.*	Thistle	<5				
1206PL01	*Cladium jamaicense*	Sawgrass	<5				
1206PL01	*Cuscuta gronovii*	Dodder, love vine	<5				
1206PL01	*Cynodon dactylon*	Bermuda grass	<5				
1206PL01	*Dichromena floridensis*	White top sedge	<5				
1206PL01	*Dichromena floridensis*	White top sedge	<5				
1206PL01	*Flaveria linearis*	Yellow top	10				
1206PL01	*Metopium toxiferum*	Poisonwood	<5				
1206PL01	*Hypericum brachyphylum*	Mint	10				
1206PL01	*Jaquemontia curtissii*	Pineland jaquemontia	<5				
1206PL01	*Lantana camara*	Shrub verbena	10				EPPC 1
1206PL01	*Lantana involucrata*	Wild sage	<5				
1206PL01	*Neyraudia reynaudiana*	Burma reed	20				EPPC I
1206PL01	*Passiflora suberosa*	Corky-stemmed Passionflower	<5				
1206PL01	*Pteris sp.*	Fern	<5				
1206PL01	*Randia aculeata*	Randia, Indigoberry	<5				

Table 3-3

HARB Phantom Lake and Old Grenade Range Area Plant Species List

Plot Identification	Plant Species	Common Name	Percent Cover	Florida Status	Federal Status	FNAI Rank	Other Status
1206PL01	*Senna bicapsularis*	Butterfly bush	<5				
1206PL01	*Smilax laurifolia*	Smilax, briar	<5				
1206PL01	*Sphenomeris clavata*	Parsley fern	<5	E		G3/S2S3	
1206PL01	*Trema micrantha*	Florida trema	<5				
1207PL02	*Andropogon sp.*	Blue stem	<5				
1207PL02	*Anemia adiantifolia*	Pine fern	<5				
1207PL02	*Aster sp.*	Aster	<5				
1207PL02	*Casuarina equisetifolia*	Australian pine	<5				EPPC I
1207PL02	*Chrysophyllum oliveform*	Satin leaf	<5	E			
1207PL02	*Cladium jamaicense*	Sawgrass	<5				
1207PL02	*Cuscuta gronovii*	Dodder, love vine	<5				
1207PL02	*Cynodon dactylon*	Bermuda grass	10				
1207PL02	*Dichromena floridensis*	White-top sedge	<5				
1207PL02	*Dodonaea viscosa*	Varnish leaf	<5				
1207PL02	*Flaveria linearis*	Yellow top	10				
1207PL02	*Forstiera segregata*	Florida privet	<5			S2	
1207PL02	*Metopium toxiferum*	Poisonwood	10				
1207PL02	*Hypericum brachyphyllum*	Mint	<5				
1207PL02	*Jacquemontia curtissii*	Pineland jacquemontia	<5	E		G2/S2	
1207PL02	*Lantana camara*	Shrub verbena	<5				EPPC 1
1207PL02	*Lantana involucrata*	Wild sage	<5				
1207PL02	*Melanthera parviflora*	Aster	<5	E			
1207PL02	*Neyraudia reynaudiana*	Burma reed	20				EPPC I
1207PL02	*Passiflora suberosa*	Passionflower	<5				
1207PL02	*Randia aculeata*	Randia, Indigoberry	<5				
1207PL02	*Samolus ebratceatus*	Water pimpernel	<5				
1207PL02	*Senna bicapsularis*	Butterfly bush	<5				
1207PL02	*Smilax laurifolia*	Smilax, briar	<5				
1207PL02	*Trema micranthum*	Florida trema	<5				
1207PL03	*Andropogon sp.*	Blue stem	<5				
1207PL03	*Aster sp.*	Aster	<5				
1207PL03	*Borrichia frutescens*	Sea daisey	<5				
1207PL03	*Byrsonima lucida*	Locustberry	<5	E		G3/S3	
1207PL03	*Cirsium sp.*	Thistle	<5				
1207PL03	*Cladium jamaicense*	Sawgrass	<5				
1207PL03	*Croton linearis*	Pineland croton	<5				
1207PL03	*Cuscuta gronovii*	Dodder, love vine	<5				
1207PL03	*Dichromena floridensis*	White top sedge	<5				
1207PL03	*Flaveria linearis*	Yellow top	10				
1207PL03	*Metopium toxiferum*	Poisonwood	10				
1207PL03	*Lantana camara*	Shrub verbena	10				EPPC 1
1207PL03	*Lantana involucrata*	Wild sage	<5				

Table 3-3

HARB Phantom Lake and Old Grenade Range Area Plant Species List

Plot Identification	Plant Species	Common Name	Percent Cover	Florida Status	Federal Status	FNAI Rank	Other Status
1207PL03	*Mint sp.*	Mint	10				
1207PL03	*Morinda royoc*	Cheese plant	<5				
1207PL03	*Neyraudia reynaudiana*	Burma reed	<5				EPPC I
1207PL03	*Pinus elliottii*	Slash pine	<5				
1207PL03	*Randia aculeata*	Randia, Indigo berry	<5				
1207PL03	*Sabal palmetto*	Sabal palm	<5				
1207PL03	*Senna bicapsularis*	Butterfly bush	<5				
1207PL03	*Smilax laurifolia*	Smilax, briar	<5				
1207PL03	*Stachytarphetta spp*	Porter weed	<5				
1207PL03	*Trema micranthum*	Florida trema	<5				
1207PL04	*Andropogon sp.*	Blue stem	<5				
1207PL04	*Anemia adiantifolia*	Pine fern	<5				
1207PL04	*Aster sp.*	Aster	<5				
1207PL04	*Borrichia frutescens*	Sea ox-eye daisey	<5				
1207PL04	*Casuarina equisetifolia*	Australian pine	<5				EPPC I
1207PL04	*Cladium jamaicense*	Sawgrass	<5				
1207PL04	*Croton linearis*	Pineland croton	<5				
1207PL04	*Dichromena floridensis*	White top sedge	<5				
1207PL04	*Flaveria linearis*	Yellow top	<5				
1207PL04	*Flaveria linearis*	Yellow top	<5				
1207PL04	*Metopium toxiferum*	Poisonwood	<5				
1207PL04	*Hyptis alata (possibly)*	Musky Mint	<5				
1207PL04	*Lantana camara*	Shrub verbena	<5				EPPC 1
1207PL04	*Neyraudia reynaudiana*	Burma reed	25				EPPC I
1207PL04	*Phychotria nervosa*	Wild coffee	<5				
1207PL04	*Pteridium aquilinum*	Braken fern	<5				Native
1207PL04	*Smilax laurifolia*	Smilax, briar	<5				
1207PL04	*Stachytarphetta spp*	Porter weed	<5				
1207PL04	*Trema micranthum*	Florida trema	<5				
1207PL05	*Andropogon sp.*	Blue stem	10				
1207PL05	*Anemia adiantifolia*	Pine fern	<5				
1207PL05	*Casuarina equisetifolia*	Australian pine	<5				EPPC I
1207PL05	*Cenchurs sp.*	Sand spur	<5				
1207PL05	*Croton linearis*	Pineland croton	10				
1207PL05	*Dichromena floridensis*	White top sedge	10				
1207PL05	*Dipholis salicifolia*	Willow bustic	<5				
1207PL05	*Flaveria linearis*	Yellow top	10				
1207PL05	*Metopium toxiferum*	Poisonwood	10				
1207PL05	*Hyptis alata (possibly)*	Musky Mint	<5				
1207PL05	*Lantana involucrata*	Wild sage	<5				
1207PL05	*Neyraudia reynaudiana*	Burma reed	<5				EPPC I
1207PL05	*Pteridium aquilinum*	Braken fern	<5				

Table 3-3

HARB Phantom Lake and Old Grenade Range Area Plant Species List

Plot Identification	Plant Species	Common Name	Percent Cover	Florida Status	Federal Status	FNAI Rank	Other Status
1207PL05	*Randia aculeata*	Randia, Indigo berry	<5				
1207PL05	*Senna bicapsularis*	Butterfly bush	<5				
1207PL05	*Setaria lutescens (or parviflora)*	Foxtail	<5				
1207PL05	*Smilax laurifolia*	Smilax, briar	<5				
1207PL05	*Stachytarphetta spp*	Porter weed	<5				
1207PL06	*Ardisia escalloniodes*	Marlberry	<5				
1207PL06	*Bursera simaruba*	Gumbo limbo	<5				
1207PL06	*Casuarina equisetifolia*	Australian pine	<5				EPPC I
1207PL06	*Chrysobalanus icaco*	Cocoplum	<5				
1207PL06	*Cladium jamaicense*	Sawgrass	<5				
1207PL06	*Croton linearis*	Pineland croton	<5				
1207PL06	*Dipholis salicifolia*	Willow bustic	<5				
1207PL06	*Flaveria linearis*	Yellow top	10				
1207PL06	*Metopium toxiferum*	Poisonwood	10				
1207PL06	*Lantana camara*	Shrub verbena	10				EPPC 1
1207PL06	*Lantana involucrata*	Wild sage	<5				
1207PL06	*Magnolia sp.*	Magnolia	<5				
1207PL06	*Mint sp.*	Mint	<5				
1207PL06	*Neyraudia reynaudiana*	Burma reed	30				EPPC I
1207PL06	*Pteridium aquilinum*	Braken fern	<5				
1207PL06	*Smilax laurifolia*	Smilax, briar	<5				
1207PL06	*Trema micranthum*	Florida trema	<5				
1207PL07	*Casuarina equisetifolia*	Australian pine	<5				EPPC I
1207PL07	*Dipholis salicifolia*	Willow bustic	10				
1207PL07	*Metopium toxiferum*	Poisonwood	10				
1207PL07	*Lantana camara*	Shrub verbena	10				EPPC 1
1207PL07	*Lantana involucrata*	Wild sage	10				
1207PL07	*Neyraudia reynaudiana*	Burma reed	35				EPPC I
1207PL07	*Selaginella sp.*	moss	<5				
1207PL07	*Smilax laurifolia*	Smilax, briar	<5				
1207PL07	*Trema micranthum*	Florida trema	10				
1207PL07	Unidentified	bunch grass	<5				
1207PL08	*Andropogon sp.*	Blue stem	<5				
1207PL08	*Casuarina equisetifolia*	Australian pine	<5				EPPC I
1207PL08	*Cynodon dactylon*	Bermuda grass	<5				
1207PL08	*Dichromena floridensis*	White top sedge	<5				
1207PL08	*Fimbristylis cymosa (var. spathacea)*	Hurricane grass	<5				
1207PL08	*Metopium toxiferum*	Poisonwood	10				
1207PL08	*Hyptis alata (possibly)*	Musky Mint	<5				
1207PL08	*Lantana camara*	Shrub verbena	10				EPPC 1

Table 3-3

HARB Phantom Lake and Old Grenade Range Area Plant Species List

Plot Identification	Plant Species	Common Name	Percent Cover	Florida Status	Federal Status	FNAI Rank	Other Status
1207PL08	*Neyraudia reynaudiana*	Burma reed	40				EPPC I
1207PL08	*Smilax laurifolia*	Smilax, briar	<5				
1207PL08	*Trema micranthum*	Florida trema	20				
1207PL09	*Anemia adiantifolia*	Pine fern	<5				
1207PL09	*Borrichia frutescens*	Sea ox-eye daisey	20				
1207PL09	*Casuarina equisetifolia*	Australian pine	<5				EPPC I
1207PL09	*Cladium jamaicense*	Sawgrass	10				
1207PL09	*Croton linearis*	Pineland croton	<5				
1207PL09	*Cynodon dactylon*	Bermuda grass	20				
1207PL09	*Dichromena floridensis*	White top sedge	15				
1207PL09	*Metopium toxiferum*	Poisonwood	<5				
1207PL09	*Hyptis alata (possibly)*	Musky Mint	<5				
1207PL09	*Lantana camara*	Shrub verbena	<5				EPPC 1
1207PL09	*Lantana involucrata*	Wild sage	10				
1207PL09	*Neyraudia reynaudiana*	Burma reed	<5				EPPC I
1207PL09	*Pteridium aquilinum*	Braken fern					
1207PL09	*Randia aculeata*	Randia, Indigo berry	<5				
1207PL09	*Rhoeo spathacea*	Oyster plant	<5				EPPC I
1207PL09	*Smilax laurifolia*	Smilax, briar	<5				
1207PL09	*Sphenomeris clavata*	Parsley fern					
1207PL09	*Trema micranthum*	Florida trema	<5				
1207PL10	*Albizia sp.*	Mimosa, silk tree	<5				
1207PL10	*Andropogon sp.*	Blue stem	<5				
1207PL10	*Anemia adiantifolia*	Pine fern	<5				
1207PL10	*Borrichia frutescens*	Sea ox-eye daisey	35				
1207PL10	*Casuarina equisetifolia*	Australian pine	<5				EPPC I
1207PL10	*Cladium jamaicense*	Sawgrass	10				
1207PL10	*Coccoloba uvifera*	Sea grape	<5				
1207PL10	*Cynodon dactylon*	Bermuda grass	10				
1207PL10	*Cynodon dactylon*	Bermuda grass	<5				
1207PL10	*Fimbristylis cymosa (var. spathacea)*	Hurricane grass	<5				
1207PL10	*Metopium toxiferum*	Poisonwood	10				
1207PL10	*Hyptis alata (possibly)*	Musky Mint	<5				
1207PL10	*Lantana camara*	Shrub verbena	<5				EPPC 1
1207PL10	*Melanthera parvifolia*	Melanthera	<5				
1207PL10	*Paspalum notatum*	Bahia grass	10				
1207PL10	*Pteridium aquilium*	Bracken fern	<5				
1207PL10	*Schinus terebinthifolius*	Brazilian pepper	<5				
1207PL10	*Sphenomeris clavata*	Parsley fern	<5	E		G3/S2S3	

Table 3-3

HARB Phantom Lake and Old Grenade Range Area Plant Species List

Plot Identification	Plant Species	Common Name	Percent Cover	Florida Status	Federal Status	FNAI Rank	Other Status

Key:

Florida Status

E = Endangered: species or isolated population so few or depleted in number or so restricted in range that it is in eminent danger of extinction.

Florida Natural Areas Inventory (FNAI) Rank

S2 = Imperiled in Florida because of extreme rarity (6-20 occurrences of less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.

S3 = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.

G2 = Imperiled globally because of extreme rarity (6-20 occurrences of less than 3,000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.

G3 = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.

G5 = Demonstrably secure globally.

G#T# = Rank of taxonomic subgroup such as a subspecies or variety; the G portion of the rank refers to the entire species and the T portion refers to the specific subgroup; numbers have the same definition as above.

Other Status

EPPC I = Invasive exotics that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives. This definition does not rely on the economic severity or geographic range of the problem, but documented ecological damage caused.

EPPC II = Invasive exotics that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species. These species may become ranked Category I, if ecological damage is demonstrated.

Wildlife/Habitat Assessment

Wildlife sighted in the Phantom Lake area includes yellow-rumped warbler (*Dendroica coronata*), kingfisher (*Ceryle aura*), mockingbird (*Mimus polyglottos*), anhinga (*Anhinga anhinga*), and osprey (*Pandion haliaetus*). These birds have easy access to the area and were seen using it for foraging, perching, and nesting. An American alligator (*Alligator mississippiensis*) nest was also sighted in this area and it is probable that both alligators and spectacled caiman (*Caiman crocodylus*), frequently use this area for feeding, and nesting. The proximity of the lake to the canal system on the Base provides accessibility for both species and several gently sloping areas around the lake exhibited signs of frequent usage. Several small snake holes were also noted along the banks of the lake. Phantom Lake, a limestone borrow pit, contains a shallow middle area with emergent vegetation surrounded by deepwater habitat along the shoreline. This diversity of water levels and aquatic vegetation are excellent habitat for native fish species such as large-mouth bass (*Micropterus salmoides floridanus*), tarpon (*Megalops atlanticus*), snook (*Centropomus undecimalis*), gar (*Lepisosteus platyrhincus*), and panfish (*Lepomis spp*.). Exotic fish species that may occur in Phantom Lake include cichlids (*Cichlasoma spp*.), oscars (*Astronotus ocellatus*), and tilapia (*Tilapia* spp.). The Phantom Lake upland area contains many native woody and herbaceous species. Mature

trees of native species were most likely established prior to the exotics and were tall enough to avoid becoming shaded out.

Management Recommendations

Restoration of this area should focus on the control and removal of the invasive exotic plant species, especially the dense populations of Burma reed that pose a fire hazard. Control techniques may include burning, manual cutting and/or herbicide application depending on the density of this species in areas where it occurs. The area is scenic, provides habitat for several native bird species, and the lake provides good recreational fishing opportunities. The Phantom Lake and Old Grenade Range Area may also be managed to serve as an outdoor-recreational facility and wildlife viewing area. Access into this area should be improved to facilitate use by recreational vehicles and avoid existing ESCZs of HARB. Fisheries management at Phantom Lake should consists of monitoring fish populations for abundance of native versus exotic species and promoting sustainable outdoor recreation use of the lake through a catch and release fishing program.

Table 3-4 provides a listing of the fish and wildlife management objectives for the Phantom Lake and Old Grenade Range Area, as well as management strategies, projects, and initiatives. Additional, Base-wide management objectives applicable to this management unit are discussed in Section 3.10. A complete listing of all the goals, objectives, strategies, projects, and initiatives are provided in Section 4 of the INRMP (see Volume I).

Table 3-4

Phantom Lake and Old Grenade Range Area Fish and Wildlife Conservation Management Objectives, Strategies, and Initiatives

Objective 2.2	Restore and maintain the natural communities surrounding Phantom Lake to support native fish and wildlife species and provide for natural resource based outdoor recreation for HARB personnel.
Strategy 2.2.1	Evaluate the focus for native habitat restoration in the Phantom Lake area and potential development of outdoor recreation opportunities. Major issues to be addressed include roadway access into the site, safety restrictions of the ESCZ arcs, demands and needs for on-base outdoor recreational activities, and capital improvement and O&M funding priorities.
Project:	*Project No. 6*: Phantom Lake Improvements and Constraints Evaluation. Cross-reference: Project No. 4- IESMP (see Volume II, Appendix A).
Initiatives	1) Promote stewardship of the natural communities and develop support within the HARB community for the restoration of the Phantom Lake area. 2) Evaluate the compatibility of restoration efforts with the BASH reduction objectives.

3.3 Southeast Triangle

Vegetation Assessment

The Southeast Triangle area (approximately 32.7 acres) is located southeast of the runway and contains the reservoir and pump house adjacent to Military Canal. Three plots were surveyed within this area (see Figure 2-2; photographs of these sites are located in Attachment A). Australian pines border most areas along the canal and maintained grasslands border the access roads. Monotypic stands of Brazilian pepper and Napier grass comprise much of the remaining area, however, many large native hardwood trees were identified scattered throughout and were most likely individuals established prior to the encroaching exotic species. Species sighted in the general area include, velvet seed (*Guettardia scabra*), caster bean (*Ricinus communis*), bishopwood (*Bishofia trifoliata;* approximately 60% of the trees in the area, not including Brazilian pepper), and potato tree (*Solanum erianthum*). No threatened or endangered species were observed in this area. Very few herbaceous species were identified here due to the lack of open canopy for establishment. Table 3-5 provides a list of plant species recorded in field survey plots on the Southeast Triangle.

Table 3-5

HARB Southeast Triangle Field Survey Plant Species

Plot Identification	Plant Species	Common Name	Percent Cover	Florida Status	Federal Status	FNAI Rank	Other Status
1210TR01	*Anthemis cotula*	Dog Fennel	<5				
1210TR01	*Penniesetum purpureum*	Napier grass	90-100				EPPC I
1210TR01	*Persea americana*	Avocado	<5				
1210TR02	*Neyraudia reynaudiana*	Burma reed	10				EPPC I
1210TR02	*Penniesetum purpureum*	Napier grass	10				EPPC I
1210TR02	*Schinus terebinthifolius*	Brazilian pepper	80				EPPC I
1210TR03	*Acrostichum sp.*	Leather fern	5				
1210TR03	*Myrica cerifera*	Wax myrtle	10				
1210TR03	*Schinus terebinthifolius*	Brazilian pepper	80				EPPC I
1210TR03	*Trema micranthum*	Florida trema	5				

Table 3-5

HARB Southeast Triangle Field Survey Plant Species

Plot Identification	Plant Species	Common Name	Percent Cover	Florida Status	Federal Status	FNAI Rank	Other Status

Key:

Florida Status

E = Endangered: species or isolated population so few or depleted in number or so restricted in range that it is in eminent danger of extinction.

Florida Natural Areas Inventory (FNAI) Rank

S2 = Imperiled in Florida because of extreme rarity (6-20 occurrences of less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.

S3 = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.

G2 = Imperiled globally because of extreme rarity (6-20 occurrences of less than 3,000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.

G3 = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.

G5 = Demonstrably secure globally.

G#T# = Rank of taxonomic subgroup such as a subspecies or variety; the G portion of the rank refers to the entire species and the T portion refers to the specific subgroup; numbers have the same definition as above.

Other Status

EPPC I = Invasive exotics that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives. This definition does not rely on the economic severity or geographic range of the problem, but documented ecological damage caused.

EPPC II = Invasive exotics that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species. These species may become ranked Category I, if ecological damage is demonstrated.

Wildlife/Habitat Assessment

Many birds were sighted foraging, perching, and nesting 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 for foraging, and many large trees for perching and nesting provide a diverse habitat for wildlife. Species observed during field surveys include double-crested cormorant (*Phalacrocorax auritus*), reddish egret (*Egretta rufenscens*), anhinga (*Anhinga anhinga*), osprey (*Pandion haliaetus*), American coot (*Fulica americana*), and red-bellied woodpecker (*Melaneerpes carolinus*).

Management Recommendations

Base-wide management objectives applicable to this management unit are discussed in Section 3.10. A complete listing of all the goals, objectives, strategies, projects, and initiatives are provided in Section 4 of the INRMP (see Volume I).

3.4 Munitions Area and Northeast Grasslands

Vegetation Assessment

This area of HARB consists of maintained grasslands within the Munitions Area fence line (approximately 122 acres) and similar grasslands in the adjacent Northeast Grasslands area (approximately 50.5 acres). The grasslands contain one or all of the common exotic grass species (e.g., Bermuda, Bahia, and St. Augustine).

Wildlife/Habitat Assessment

These grasslands are frequently used by burrowing owls (*Athene cunicularia floridana*, formerly *Speotyto cunicularia*) for nesting and foraging. Although burrowing owls are 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 as well as winter migrants. Burrowing owls use fence posts and other high perches to hunt their main prey consisting of small reptiles, amphibians and arthropod insects.

Grounds maintenance within the Munitions Area provides for the continual, year-round mowing to support a 2- to 4-inch vegetation height pattern (see Volume I, Figure 3-6 of the INRMP). A buffer is allowed around owl burrows where grass is left in the rough. However, no survey of owl burrows has been performed whereby recommendations could be made to further the use of buffers throughout HARB in suitable areas.

Table 3-6 provides a listing of the fish and wildlife management objectives for the Munitions Area and Northeast Grasslands, as well as management strategies, projects, and initiatives. Additional, Base-wide management objectives applicable to this management unit are discussed in Section 3.10. A complete listing of all the goals, objectives, strategies, projects, and initiatives are provided in Section 4 of the INRMP (see Volume I).

Table 3-6

Munitions Area and Northeast Grasslands Fish and Wildlife Conservation Management Objectives, Strategies, and Initiatives

Objective 2.4	Protect and maintain known and potential burrowing owl habitat.	
Strategy 2.4.1	Continue to protect owl burrows from harassment and/or disturbances by people.	
Initiatives	1)	During the nesting season, burrows would be flagged (with signs) and/or mapped to highlight areas where buffer distances for activity are required.
	2)	Promote stewardship for the conservation of burrowing owls by distributing information on this species to the HARB personnel that may work in or near these protected areas.
	3)	Conduct qualitative surveys of active burrows during nesting season, as funds are available.

3.5 Grenade Range and Reserves Area

Vegetation Assessment

The Grenade Range and Reserves Area (approximately 116.6 acres) is located south of Phantom Lake and is characterized by mostly undeveloped areas with a mix of open grasslands and small monotypic Australian pine stands. Seven field survey plots were established in the area. The BIVWAK reserve training facility used for wilderness training is located along the western boundary of the site. This area consists of a large area of maintained, mowed grasses with a few Australian pines and Brazilian pepper stands in the center. Many plants identified in the open areas are those of typical grassland communities. Soils consist of a thin overlay of sand over limestone and many areas showing limestone outcrops have very little vegetation.

Although the Grenade Range does not contain the dense populations of Burma reed, Napier grass, Brazilian pepper, and Australian pine found in other areas of HARB, some areas support significant invasive plant growth and other areas contain small monotypic stands. Because most of the canopy remains open with many native species constituting the majority of the cover species in some areas, exotic species management would most likely have good results. Table 3-7 lists plant species recorded for the Grenade Range and Reserves Area.

Table 3-7

HARB Grenade Range and Reserves Area Field Survey Plant Species List

Plot Identification	Plant Species	Common Name	Percent Cover	Florida Status	Federal Status	FNAI Rank	Other Status
1211GF01	*Andropogon sp.*	Blue stem	<5				
1211GF01	*Aster sp.*	Aster	<5				
1211GF01	*Bougainvillea glabra*	Bouganvillia	<5				
1211GF01	*Byrsonima lucida*	Locustberry	<5	E		G3/S3	
1211GF01	*Casuarina equisetifolia*	Australian pine	<5				EPPC I
1211GF01	*Casuarina equisetifolia*	Australian pine	<5				EPPC I
1211GF01	*Cirsium (possibly englemanii)*	Thistle	<5				
1211GF01	*Cladium jamaicense*	Sawgrass	<5				
1211GF01	*Croton linearis*	Pineland croton	<5				
1211GF01	*Cynodon dactylon*	Bermuda grass	<5				
1211GF01	*Cynodon dactylon*	Bermuda grass	<5				
1211GF01	*Fimbristylis cymosa (var. spathacea)*	Hurricane grass	<5				
1211GF01	*Flaveria linearis*	Yellow top	10				
1211GF01	*Metopium toxiferum*	Poisonwood	<5				
1211GF01	*Hyptis alata (possibly)*	Musky Mint	<5				
1211GF01	*Lantana camara*	Shrub verbena	10				EPPC 1
1211GF01	*Lantana involucrata*	Wild sage	15				

Table 3-7

HARB Grenade Range and Reserves Area Field Survey Plant Species List

Plot Identification	Plant Species	Common Name	Percent Cover	Florida Status	Federal Status	FNAI Rank	Other Status
1211GF01	*Myrsine*	Myrsine	<5				
1211GF01	*Neyraudia reynaudiana*	Burma reed	20				EPPC I
1211GF01	*Samolus ebracteatus*	Water pimpernel	10				
1211GF01	*Schinus terebinthifolius*	Brazilian pepper	<5				EPPC 1
1211GF01	*Solanum macranthum*	Potato tree	<5				
1211GF01	*Spenomeris clavata*	Parsley fern	<5				
1211GF01	*Stachytarphetta spp*	Porter weed	10				
1211GF01	*Trema micranthum*	Florida trema	15				
1211GF02	*Bougainvillea glabra*	Bougainvillea	<5				
1211GF02	*Casuarina equisetifolia*	Australian pine	70				EPPC I
1211GF02	*Cladium jamaicense*	Sawgrass	<5				
1211GF02	*Croton linearis*	Pineland croton	<5				
1211GF02	*Dichromena floridensis*	White-top sedge	<5				
1211GF02	*Metopium toxiferum*	Poisonwood	<5				
1211GF02	*Hyptis alata (possibly)*	Musky Mint	<5				
1211GF02	*Lantana involucrata*	Wild sage	<5				
1211GF02	*Neyraudia reynaudiana*	Burma reed	<5				EPPC I
1211GF02	*Pteris sp.*	Fern	<5				
1211GF02	*Stachytarphetta spp*	Porter weed	<5				
1211GF03	*Andropogan sp.*	Blue stem	<5				
1211GF03	*Casuarina equisetifolia*	Australian pine	<5				EPPC I
1211GF03	*Flaveria linearis*	Yellow top	15				
1211GF03	*Hyptis alata (possibly)*	Musky Mint	<5				
1211GF03	*Lantana camara*	Shrub verbena	<5				EPPC 1
1211GF03	*Neyraudia reynaudiana*	Burma reed	30				EPPC I
1211GF03	*Samolus ebracteatus*	Water pimpernel	10				
1211GF03	*Solanum macranthum*	Potato tree	15				
1211GF03	*Stachytarphetta spp*	Porter weed	15				
1211GF04	*Anemia adiantifolia*	Pine fern	<5				
1211GF04	*Bursera simaruba*	Gumbo limbo	30				
1211GF04	*Casuarina equisetifolia*	Australian pine	15				EPPC I
1211GF04	*Neyraudia reynaudiana*	Burma reed	<5				EPPC I
1211GF04	*Parthenocissus quinquefolia*	Virginia creeper	<5				
1211GF04	*Pteridium aquilinum*	Braken fern	<5				
1211GF04	*Pychotria nervosa*	Wild coffee	15				
1211GF04	*Schinus terebinthifolius*	Brazilian pepper	<5				
1211GF04	*Smilax laurifolia*	Smilax, briar	<5				
1211GF04	*Solanum macranthum*	Potato tree	10				
1211GF04	*Spenomeris clavata*	Parsley fern					
1211GF04	*Vitis roundifolia*	Muscadine grape	<5				
1211GF05	*Ardisia elliptica*	Shoe button ardisia	20				EPPC I
1211GF05	*Bursera simaruba*	Gumbo limbo	20				
1211GF05	*Neyraudia reynaudiana*	Burma reed	40				EPPC I
1211GF05	*Pteris sp.*	Fern	<5				

Table 3-7

HARB Grenade Range and Reserves Area Field Survey Plant Species List

Plot Identification	Plant Species	Common Name	Percent Cover	Florida Status	Federal Status	FNAI Rank	Other Status
1211GF05	*Pychotria nervosa*	Wild coffee	15				
1211GF05	*Sabal palmetto*	Cabbage palm	<5				
1211GF06	*Ardisia elliptica*	Shoe button ardisia	15				EPPC I
1211GF06	*Casuarina equisetifolia*	Australian pine	15				EPPC I
1211GF06	*Dipholis salicifolia*	Willow bustic	10				
1211GF06	*Metopium toxiferum*	Posionwood	10				
1211GF06	*Neyraudia reynaudiana*	Burma reed	40				EPPC I
1211GF06	*Schinus terebinthifolius*	Brazilian pepper	<5				
1211GF06	*Solanum macranthum*	Potato tree	10				
1211GF06	*Trema micranthum*	Florida trema	10				
1211GF06		Ferns	<5				
1211GF07	*Andropogon sp.*	Blue stem	30				
1211GF07	*Aster sp.*	Aster	10				
1211GF07	*Dichromena floridensis*	White top sedge	20				
1211GF07	*Fimbristylis cymosa (var. spathacea)*	Hurricane grass	<5				
1211GF07	*Flaveria linearis*	Yellow top	10				
1211GF07	*Hyptis alata (possibly)*	Musky Mint	15				
1211GF07	*Stachytarphetta spp*	Porter weed	10				

Key:

Florida Status

E = Endangered: species or isolated population so few or depleted in number or so restricted in range that it is in eminent danger of extinction.

Florida Natural Areas Inventory (FNAI) Rank

S2 = Imperiled in Florida because of extreme rarity (6-20 occurrences of less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.

S3 = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.

G2 = Imperiled globally because of extreme rarity (6-20 occurrences of less than 3,000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.

G3 = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.

G5 = Demonstrably secure globally.

G#T# = Rank of taxonomic subgroup such as a subspecies or variety; the G portion of the rank refers to the entire species and the T portion refers to the specific subgroup; numbers have the same definition as above.

Other Status

EPPC I = Invasive exotics that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives. This definition does not rely on the economic severity or geographic range of the problem, but documented ecological damage caused.

EPPC II = Invasive exotics that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species. These species may become ranked Category I, if ecological damage is demonstrated.

Wildlife/Habitat Assessment

Given the composition of the seed-producing grasses, many small mammals would be expected to use this area for foraging. As a result, this area provides good foraging grounds for birds such as osprey (*Pandion haliaetus*) 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 consists of fish. Birds that were noted in this area include the American coot (*Fulica americana*), yellow-rumped warbler (*Dendroica coronata*), kingfisher (*Ceryle alcyon*), loggerhead shrike (*Lanis ludovicianus*), mockingbird (*Mimus polyglottos*), and rough-winged swallow (*Stelgidopteryx serripennis*).

Management Recommendations

The extent of the invasive exotic species established in this area would require intensive removal methods and a management plan for long-term maintenance. This area provides a seed base for invasive exotic dispersal to other areas of the Base. The potential for wildlife in this area would be increased following removal of exotics and management of a native vegetation community.

Table 3-8 provides a listing of the fish and wildlife management objectives for the Munitions Area and Northeast Grasslands, as well as management strategies, projects, and initiatives. Additional, Base-wide management objectives applicable to this management unit are discussed in Section 3.10. A complete listing of all the goals, objectives, strategies, projects, and initiatives are provided in Section 4 of the INRMP (see Volume I).

Table 3-8

Grenade Range and Reserves Area Fish and Wildlife Conservation Management Objectives, Strategies, and Initiatives

Objective 2.5	Restore and maintain the Grenade Range and Reserves Area to support wildlife species in a manner that is compatible with the military mission.
Strategy 2.5.1	Evaluate the feasibility of enhancing the natural functions of these areas through the removal of invasive and exotic plant species.
Project:	Cross-reference: Project No. 4- IESMP (see Volume II, Appendix A).
Initiatives	1) Ensure the continuation of ongoing training activities in the area. 2) Evaluate the compatibility of restoration efforts with the BASH reduction objectives.

3.6 Southwest Clear Zone

Vegetation Assessment

The Southwest Clear Zone area is located in the southwest corner of HARB, just south of the Grenade Range. Soils consist of limestone outcrops with little to no sand or soil overlay. The area contains heavy populations of Brazilian pepper and Australian pine. Two field survey plots were chosen to reflect this habitat so that one survey plot was established in the area containing the Brazilian pepper thicket and the second was located in the Australian pine stand. Few other species exist in this location except for along the edge of the Brazilian pepper thicket and a few herbaceous

and woody species in the Australian pine stand. The site also contains open fields of regularly mowed and maintained grasses. Table 3-9 provides a list of plant species recorded for this area.

Table 3-9

HARB Southwest Clear Zone Field Survey Plant List

Plot Identification	Plant species	Common name	Percent Cover	Florida Status	Federal Status	FNAI Rank	Other Status
1211SW01	*Ardisia elliptica*	Shoe button ardisia	<5				EPPC 1
1211SW01	*Dipholis salicifolia*	Willow bustic	<5				
1211SW01	*Metopium toxiferum*	Poisonwood	<5				
1211SW01	*Lantana camara*	Shrub verbena	<5				EPPC 1
1211SW01	*Schinus terebinthifolius*	Brazilian pepper	80				EPPC I
1211SW02	*Anemia adiantifolia*	Pine fern	<5				
1211SW02	*Ardisia elliptica*	Shoe button ardisia	<5				EPPC I
1211SW02	*Casuarina equisetifolia*	Australian pine	85				EPPC I
1211SW02	*Chrysobalanus icaco*	Cocoplum	<5				
1211SW02	*Cladium jamaicense*	Sawgrass	<5				
1211SW02	*Dipholis salicifolia*	Willow bustic	<5				
1211SW02	*Metopium toxiferum*	Poisonwood	<5				
1211SW02	*Schinus terebinthifolius*	Brazilian pepper	<5				EPPC I
1211SW02	*Stachytarphetta spp*	Porter weed	<5				
1211SW02	*Trema micranthum*	Florida trema	<5				

Key:

Florida Status

E = Endangered: species or isolated population so few or depleted in number or so restricted in range that it is in eminent danger of extinction.

Florida Natural Areas Inventory (FNAI) Rank

S2 = Imperiled in Florida because of extreme rarity (6-20 occurrences of less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.

S3 = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.

G2 = Imperiled globally because of extreme rarity (6-20 occurrences of less than 3,000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.

G3 = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.

G5 = Demonstrably secure globally.

G#T# = Rank of taxonomic subgroup such as a subspecies or variety; the G portion of the rank refers to the entire species and the T portion refers to the specific subgroup; numbers have the same definition as above.

Table 3-9

HARB Southwest Clear Zone Field Survey Plant List

Plot Identification	Plant species	Common name	Percent Cover	Florida Status	Federal Status	FNAI Rank	Other Status

Other Status

EPPC I = Invasive exotics that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives. This definition does not rely on the economic severity or geographic range of the problem, but documented ecological damage caused.

EPPC II = Invasive exotics that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species. These species may become ranked Category I, if ecological damage is demonstrated.

Management Recommendations

The extent of the invasive exotic species established in this area would require intensive removal methods and a management plan for long-term maintenance. This area provides a seed base for invasive exotic dispersal to other areas of the Base.

Base-wide management objectives applicable to this management unit are discussed in Section 3.10. A complete listing of all the goals, objectives, strategies, projects, and initiatives are provided in Section 4 of the INRMP (see Volume I).

3.7 Hush House Area, Wetland Marsh Area, Twin Lakes and Wetland Fringe Area

Hush House Area

Vegetation Assessment

The Hush House area (approximately 30.6 acres), Wetland Marsh area (approximately 34.4 acres), and Twin Lakes and Wetland Fringe area (approximately 40.8 acres) are all located in the southern portion of HARB. The Hush House area substrate is primarily exposed limestone with a few areas of thin sand overlay. Three field survey plots were established within this area. Photographs in Attachment A illustrate the present condition of fish and wildlife habitat in the Hush House area. The Hush House area consists of an open field with various herbaceous species, including a large population of Pineland jaquemontia (*Jaquemontia curtissii*), a Brazilian pepper thicket, and an Australian pine stand. Many native herbaceous species were identified along the fringe of the Australian pepper stand and within the open field. Table 3-10 is a list of plant species recorded at this site.

Table 3-10

HARB Hush House Field Survey Plant List

Plot Identification	Plant Species	Common Name	Percent Cover	Florida Status	Federal Status	FNAI Rank	Other Status
1210HH01	*Albizia sp.*	Mimosa, silk tree	<5				
1210HH01	*Andropogon sp.*	Blue stem	<5				
1210HH01	*Aster sp.*	Aster	<5				
1210HH01	*Borrichia frutescens*	Sea ox-eye daisey	<5				
1210HH01	*Casuarina equisetifolia*	Australian pine	<5				EPPC I
1210HH01	*Circium (possibly englemanii)*	Thistle	<5				
1210HH01	*Croton linearis*	Pineland croton	10				
1210HH01	*Cuscuta gronovii*	Dodder, love vine	<5				
1210HH01	*Cynodon dactylon*	Bermuda grass	<5				
1210HH01	*Dichromena floridensis*	White top sedge	<5				
1210HH01	*Dipholis salicifolia*	Willow bustic	<5				
1210HH01	*Eupatorium capillifolium*	Dog fennel	<5				
1210HH01	*Fimbristylis cymosa*	Hurricane grass	<5				
1210HH01	*Flaveria linearis*	Yellow top	<5				
1210HH01	*Flaveria linearis*	Yellow top	10				
1210HH01	*Hyptis alata (possibly)*	Musky Mint	<5				
1210HH01	*Lantana camara*	Shrub verbena	20				EPPC I
1210HH01	*Lantana involucrata*	Wild sage	15				
1210HH01	*Myrica cerifera*	Wax myrtle	<5				
1210HH01	*Myrsine floridana*	Myrsine	<5				
1210HH01	*Ricinus communis*	Caster bean	<5				EPPC II
1210HH01	*Stachytarphetta spp*	Porter weed	10				
1210HH01	*Trema micranthum*	Florida trema	<5				
1210HH02	*Penniesetum purpureum*	Napier grass	5				EPPC I
1210HH02	*Schinus terebinthifolius*	Brazilian pepper	95				EPPC I
1210HH03	*Schinus terebinthifolius*	Brazilian pepper	100				EPPC I

Key:

Florida Status

E = Endangered: species or isolated population so few or depleted in number or so restricted in range that it is in eminent danger of extinction.

Florida Natural Areas Inventory (FNAI) Rank

S2 = Imperiled in Florida because of extreme rarity (6-20 occurrences of less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.

S3 = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.

G2 = Imperiled globally because of extreme rarity (6-20 occurrences of less than 3,000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.

Table 3-10

HARB Hush House Field Survey Plant List

Plot Identification	Plant Species	Common Name	Percent Cover	Florida Status	Federal Status	FNAI Rank	Other Status

G3 = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.
G5 = Demonstrably secure globally.
G#T# = Rank of taxonomic subgroup such as a subspecies or variety; the G portion of the rank refers to the entire species and the T portion refers to the specific subgroup; numbers have the same definition as above.

Other Status

EPPC I = Invasive exotics that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives. This definition does not rely on the economic severity or geographic range of the problem, but documented ecological damage caused.
EPPC II = Invasive exotics that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species. These species may become ranked Category I, if ecological damage is demonstrated.

Wetland Marsh Area

Vegetation Assessment

The Wetland Marsh area (approximately 34.4 acres) is located southeast of the runway and adjacent to the Hush House Area (see Figure 2-1). The Wetland Marsh area consists primarily of cattail (*Typha spp*.), spikrushes (*Eleocharis spp*.) with an open canopy of Australian pine (*Casuarina equisetifolia*).

Wildlife/Habitat Assessment

The Wetland Marsh area supports habitat important to many native bird species. Birds sighted during surveys included many 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 (*Bubulcu ibis*), green-backed heron (*Butorides striatus*), little blue heron (*Egretta caerulea*), reddish egret (*Egretta rufescens*), snowy egret (*Egretta thula*), tricolor heron (*Egretta tricolor*), white ibis (*Eudocimus albus*), and double-crested cormorant (*Phalacrocorax auritus*). One species of raptor, the red-shouldered hawk (*Buteo lineatus*) was also observed. The wetland and surrounding uplands also provide habitat for small mammals and snakes native to South Florida. Raccoon tracks and gastropod shells were also observed in this area.

Twin Lakes and Wetland Fringe Area

Vegetation Assessment

The Twin Lakes and Wetland Fringe area (approximately 40.8 acres) is located southeast of the runway and adjacent to the Hush House area (see Figure 2-1). This site consists of two deep water

borrow lakes with an emergent wetland fringe composed primarily of cattails (*Typha latifolius*). Australian pine stands surround the lake and provide shade and roosting areas for wildlife.

Wildlife/Habitat Assessment

American alligator (*Alligator mississippiensis*) and spectacled caiman (*Caiman crocodylus*) are known to inhabit the Twin Lakes. Alligator access paths are common along the lake edges. Presently, the federal status of the alligator is listed as threatened due to similarity of appearance to the endangered American crocodile (*Crocodylus acutus*). The state status of the alligator is listed as a Species of Special Concern (SSC). The alligator and caiman populations in surface waters of HARB may affect the BASH potential on the airfield.

Native fish species common within the deepwater habitat of Twin Lakes are those commonly found in South Florida including large-mouth bass (*Micropterus salmoides floridanus*), gar (*Lepisosteus platyrhincus*), and panfish (*Lepomis spp*.). Tarpon (*Megalops atlanticus*) and snook (*Centropomus undecimalis)*, which occur in the canals of HARB, may also occasionally occur within the Twin Lakes. Exotic fish species that may occur in the Twin Lakes are cichlids (*Cichlasoma* spp.), oscars (*Astronotus ocellatus*) and tilapia (*Tilapia* spp.).

Management Recommendations

Field surveys would be required by HARB or may be contracted out to monitor the population of the alligator and spectacled caiman. The monitoring results would be used to assist with the development of a management program to ensure continued compliance with the existing HARB BASH plan (see Volume II, Appendix D) and reduce potential for airfield safety hazards.

Table 3-11 provides a listing of the fish and wildlife management objectives for the Hush House, Wetland Marsh, and Twin Lakes Wetland Fringe Area, as well as management strategies, projects, and initiatives. Additional, Base-wide management objectives applicable to this management unit are discussed in Section 3.10. A complete listing of all the goals, objectives, strategies, projects, and initiatives are provided in Section 4 of the INRMP (see Volume I).

Table 3-11

Hush House, Wetland Marsh, and Twin Lakes Wetland Fringe Area Fish and Wildlife Conservation Management Objectives, Strategies, and Initiatives

Objective 2.2	Restore and maintain the natural communities surrounding Twin Lakes to support native fish and wildlife species and provide for natural resource based outdoor recreation for the HARB personnel.	
Strategy 2.2.1	Evaluate limitations and constraints for habitat enhancement in the Twin Lakes for providing passive recreation access. Factors to address include access, security and safety aspects for providing recreational fishing in these lakes, (that are located between the airfield and property fence line); the airfield storm water drainage system function and performance; the airfield primary and transitional zone requirements; and BASH plan (see Volume II, Appendix D) objectives for reducing potential for bird strikes.	
Project:	*Project No. 7*: Twin Lakes Feasibility Study. Cross-reference: Project No. 4-IESMP (see Volume II, Appendix A).	
Initiatives	1)	Promote stewardship of the natural communities and develop support within the HARB community for the restoration of Twin Lakes and Wetland Fringe area.
	2)	Evaluate the compatibility of restoration efforts with the BASH reduction objectives.

3.8 Airfield

Vegetation Assessment

The majority of unimproved lands on HARB consist of freshwater wetland communities (approximately 233 acres of the HARB). Most of the Airfield wetlands are located within the primary surface of the airfield safety clearances and extending outward into transitional and approach/departure clear zones. Between the taxiway and runway is a system of connected wetland drainage swales that remove surface water from the runway. The predominant vegetation within the Airfield wetlands consists of spikerushes (*Eleocharis* spp.), white-top sedge (*Dichromena colorata*), hurricane grass (*Fimbristylis spathacea*), torpedo grass (*Panicum repens*), beakrush (*Rhyncaspora* spp.), coinwort (*Centella asiatica*), pennywort (*Hydrocotyle bonariensis*), and water hyssop (*Bacopa* spp.). In areas that remain inundated or saturated for longer periods, cattails (*Typha* spp.), sawgrass (*Cladium jamaicense*), and periphyton mats were observed.

Three survey plots (1212MANE, 1212MAET, and 1212MADUMP) were taken in the Airfield area locations regularly maintained and mowed by the HARB. These points were taken to obtain a broader characterization of the vegetative communities on HARB. These sites contained one or all of the grass species Bermuda, Bahia, and St. Augustine grass. The unmaintained areas surrounding these plots contained exotic species such as Brazilian pepper, Napier grass, Australian pine, and Burma reed.

Wildlife/Habitat Assessment

The majority of Airfield wetlands are mowed to maintain 7-inch to 12-inch vegetation height year-round for compliance with airfield safety clearance and BASH criteria (see Volume I, Figure 3-6). Species observed in the mowed wetland areas of the airfield were meadowlark (*Sturnella ludovicianae*) and American kestrel (*Falco sparverius*). Some areas where grounds maintenance activities are restricted due to saturated soils or standing water are treated with an aerial application of Rodeo™ twice a year to control vegetation height. Fish and wildlife use is concentrated in portions of the site that remain saturated or inundated for longer periods. Species observed in these areas of standing water were terns (*Sterna* spp.), great egret (*Ardea alba*), cattle egret (*Bubulcus ibis*), snowy egret (*Egretta thula*), great blue heron (*Ardea herodia*), green-backed heron (*Butorides striatus*), little blue heron (*Egretta caerulea*), and tricolor heron (*Eudocimus albus*).

Management Recommendations

Base-wide management objectives applicable to this management unit are discussed in Section 3.10. A complete listing of all the goals, objectives, strategies, projects, and initiatives are provided in Section 4 of the INRMP (see Volume I).

3.9 Boundary Canal

Vegetation Assessment

The Boundary Canal system (approximately 40,400 feet [7.8 miles]) on HARB is divided into two major segments: the W-S (approximately 25,000 feet [4.9 miles] and the N-E (approximately 15,400 feet [2.9 miles] segments (see Figure 2-1). The canal delineates most of the east, south, and west boundaries of the Base and conveys most of the storm water runoff from the Base to the reservoir southeast of the runway. The canal berm in several areas of the Boundary Canal, in particular the western segment, contains many native trees. Species observed included tetrazygia (*Tetrazygia bicolor*), myrsine (*Myrsine floridana*), cocoplum (*Chrysobalanus icaco*), and pineland croton (*Croton linearis*). Although not detected within the field survey plots, the state endangered wedgelet fern (*Sphenomeris clavata*) was previously reported along the western segment of the Boundary Canal (ANL 1997). Brazilian pepper and Australian pine are also found in various densities along portions of the Boundary Canal.

Wildlife/Habitat Assessment

The Boundary Canal provides deepwater habitat and route of dispersal for the fisheries of HARB. It was constructed by excavating through coral/limestone bedrock and is rectangular-shaped.

Water visibility is high and the canal bottom is littered in some areas with fallen Australian pine trees that provide refuge for fish, amphibians and reptiles.

Native fish species common within the deepwater habitat of the Boundary Canal are large-mouth bass (*Micropterus salmoides floridanus*), gar (*Lepisosteus platyrhincus*), and panfish (*Lepomis* spp.). Tarpon (*Megalops atlanticus*) and snook (*Centropomus undecimalis*) may also occasionally occur within the Boundary Canal. Exotic fish species common in south Florida canals that may occur here are cichlids (*Cichlasoma* spp.), oscars (*Astronotus ocellatus*), and tilapia (*Tilapia* spp.).

Management Recommendations

Table 3-12 provides a listing of the fish and wildlife management objectives for the Boundary Canal, as well as management strategies, projects, and initiatives. Base-wide management objectives 1.4, 2.7, and 2.8 are applicable to this management unit and are discussed in Section 3.10. A complete listing of all the goals, objectives, strategies, projects, and initiatives are provided in Section 4 of the INRMP (see Volume I).

Table 3-12

Boundary Canal Fish and Wildlife Conservation Management Objectives, Strategies, and Initiatives

Objective 2.6	Enhance and conserve the diversity of the native fish community within the Boundary Canal.	
	Strategy 2.6.1	Evaluate the feasibility of removing exotic fish species from the Boundary Canal to promote the existence and diversity of native fish communities at HARB. Efforts for accomplishing this objective will be consistent with the community's regional plans and programs by lessening the potential that HARB would inadvertently become a source of exotic fish species within the drainage system of South Miami-Dade County.
	Project	*Project No. 8:* Feasibility study for considering the removal of exotic fish species from the Boundary Canal system.
	Initiative	Promote awareness of the problems associated with exotic aquatic species within the Boundary Canal among the HARB community. Cross-Reference: Strategy 3.2.1 Awareness and stewardship.

3.10 Base-Wide Management for Fish and Wildlife

The management recommendations previously discussed in this section have focused on activities to be conducted within each of the land management units discussed. Because in many cases, it is appropriate as well as necessary, for management recommendations to transcend land management unit boundaries, this section presents management objectives, strategies, and initiatives, to be implemented throughout the Base.

Table 3-13 provides a listing of the fish and wildlife management objectives for the Base, as well as management strategies, projects, and initiatives. A complete listing of all the goals, objectives, strategies, projects, and initiatives is provided in Section 4 of the INRMP (see Volume I).

Table 3-13

Base-Wide Fish and Wildlife Management
Objectives, Strategies, Projects, and Initiatives

Objective 1.4	Reduce and control populations of invasive and exotic plant species to minimize conflicts with the military mission and to reduce adverse impacts to existing native communities.
Strategy 1.4.1	Prepare an Invasive and Exotic Species Management Plan (IESMP) consistent with the direction and intent of Section 2 of EO 13112. The IESMP will consist, at a minimum, of nine component plans. The component plans will be coordinated and integrated with the projects identified in the INRMP, and discussed below:
Project	*Project No. 4:* IESMP. (1) The Twin Lakes and Wetland Fringe area. (2) The Grenade Range. (3) Remnant Pine Rockland. (4) Phantom Lake area. (5) Operable Unit 2. (6) Wetland Marsh area. (7) Southeast Triangle. (8) Old Grenade Range North of Phantom Lake.
Objective 2.4	Protect and maintain known and potential burrowing owl habitat.
Strategy 2.4.1	Continue to protect owl burrows from harassment and/or disturbances by people.
Initiatives	1) During the nesting season, burrows would be flagged (with signs) and/or mapped to highlight areas where buffer distances for activity are required. 2) Promote stewardship for the conservation of burrowing owls by distributing information on this species to the HARB personnel that may work in or near these protected areas. 3) Conduct qualitative surveys of active burrows during nesting season, as funds are available.

Table 3-13

Base-Wide Fish and Wildlife Management
Objectives, Strategies, Projects, and Initiatives

Objective 2.7 Conserve and protect the habitats for federal and state listed T/E species, and species of concern

Strategy 2.7.1 Maintain and protect natural features supporting populations of endangered plant and animal species.

Initiatives

1) Maintain maps of natural features that occur within the Base (e.g., wetlands, surface water bodies, natural communities, etc.) The maps will be used to:
   - Increase the awareness of HARB personnel toward the location and importance of natural features and T/E species that are present on the Base.
   - Provide information to Base personnel on conservation measures that can be implemented to avoid adverse impacts to protected species and their habitats.
   - Identify baseline conditions for comparison purposes in order to monitor HARB efforts for providing conservation management of habitats for protected species.
2) For any newly identified, federally listed plant and animal species on HARB, coordinate with AFCEE and AFRC HQ to evaluate the need for modifications or initiation of habitat conservation plans.
3) Evaluate the compatibility of restoration efforts with BASH reduction objectives.

Objective 2.8 Control nuisance wildlife populations that may adversely affect human health, welfare and/or the military mission.

Strategy 2.8.1 Eliminate or minimize the presence of nuisance animals and the adverse effect these have on native species populations and the military mission.

Initiatives

1) Determine the population density and distribution of the caiman within the Base. Evaluate the potential airfield hazard posed by caiman activity. Identify potential sources of introduction (access points into HARB) from adjacent properties.
2) Exotic fish removal within the Boundary Canal.
3) As a BASH reduction measure, consider 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.
4) Eliminate fire ant colonies, rodents, and other pests on the grounds of the Base through the continued implementation of the Integrated Pest Management Program.

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Attachment A
Wildlife Plot Photographs

for the

Fish and Wildlife/Threatened and Endangered Species Management Component Plan for the Integrated Natural Resources Management Plan

Photograph 1.
Field Survey Point 127PR1: Facing west from center point – Mixed trees and Burma reed at canal edge. (12/10/01)

Photograph 2.
Field Survey Point 127PR2: Eastern side of Remnant Pine Rockland adjacent to Fuel Farm. (12/10/01)

Photograph 3.
Field Survey Point 127PR3: Australian pine and slash pine. (12/10/01)

Photograph 4.
Field Survey Point 127PL2: Phantom Lake from center facing east. Access road and vehicles. (12/07/01)

Photograph 5.
Field Survey Point 127PL3: Phantom Lake from north. (12/07/01)

Photograph 6.
Field Survey Point 127PL4: Phantom Lake from north. (12/07/01)

Photograph 7.
Field Survey Point 127PL5: Phantom Lake from southwest corner of plot facing northeast to plot. (12/07/01)

Photograph 8.
Field Survey Point 127PL6: Phantom Lake from center point facing west. (12/07/01)

Photograph 9.
Field Survey Point 127PL7: Phantom Lake from center point facing northeast. (12/07/01)

Photograph 10.
Field Survey Point 127PL8: Phantom Lake from center point facing north. (12/07/01)

Photograph 11.
Field Survey Point 127PL9: Phantom Lake from center point facing southwest. (12/07/01)

Photograph 12.
Field Survey Point 127PL9: Phantom Lake with *Typha* spp. and snags in water. (12/07/01)

Photograph 13.
Field Survey Point 127PL10: Anhinga perched in Australian pines on small island in Phantom Lake. (12/07/01)

Photograph 14.
Field Survey Point 1210TR1: Facing west from road – Australian pines along canal banks. (12/10/01)

Photograph 15.
Field Survey Point 1210TR2: Facing north from access road – machete opening in monoculture of Brazilian pepper. (12/10/01)

Photograph 16.
Field Survey Point 1210TR3: Facing northeast from road – Napier grass and unknown tree with trifoliate leaf. (12/10/01)

Photograph 17.
Field Survey Point 1211GF1: From road facing northwest to 1211GF1 near canal. (12/11/01)

Photograph 18.
Field Survey Point 1211GF2: Australian pine stand facing northeast of plot. (12/11/01)

Photograph 19.
Field Survey Point 1211GF3: Facing northwest to plot – open field with surrounding areas of Australian pines. (12/11/01)

Photograph 20.
Survey of BIVWAK reserve training area: From Road facing northwest to 1211GF1 near canal. (12/11/01)

Photograph 21.
Field Survey Point 1211GF4: Facing east from canal – Australian pine snags. E & E employee cutting through growth. (12/11/01)

Photograph 22.
Field Survey Point 1211GF5: From in front of canal and GF5 (snags). (12/11/01)

Photograph 23.
Field Survey Point 1211GF6: Facing west along canal – Australian pine snags on bank. (12/11/01)

Photograph 24.
Field Survey Point 1211GF7: Facing northwest – open area with snags in the background. (12/11/01)

Photograph 25.
Field Survey Point 1211SW1: Facing southwest, Brazilian pepper monoculture with Australian pines in background. (12/11/01)

Photograph 26.
Near Hush Houses, facing northeast from clearing to Hush Houses. (12/10/01)

Photograph 27.
Field Survey Point 1210HH1: Facing north – Burma reeds. (12/10/01)

Photograph 28.
Field Survey Point: 1210HH2: Facing southwest – Brazilian pepper monoculture. (12/10/01)

Photograph 29.
Field Survey Point: 1210HH3: Canal and Brazilian pepper facing south. (12/10/01)

G Plant and Wildlife Lists

Table G-1

HARB Master Plant List (Native and Non-Native Species)

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
Anemia adiantifolia	Pine fern	*Muhlenbergia filipes*	Muhly grass
Anthemis cotula	Dog fennel	*Myrica cerifera*	Wax myrtle or bayberry
Ardisia elliptica	Shoebutton ardisia	*Myrsine floridana*	Myrsine
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
Bourreria terminalis	Everglade false buttonweed	*Passiflora suberosa*	Corky-stemmed passionflower
Borrichia frutescens	Sea ox-eye daisy	*Pennisetum purpureum*	Napier grass
Bougainvillea glabra	Bougainvillea	*Persea americana*	Bay or Avocado
Brassaia actinophylla	Schefflera	*Phoenix dactylifera*	Date palm
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
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	*Psilotum nudum*	Whisk fern
Chamaesyce mendezii	Mendez's sandmat	*Psychotria undata*	Wild coffee
Chamaesyce porteriana	Porter's spurge		
Chrysobalanus icaco	Coco plum	*Pteris bahamensis*	Bahama ladder brake fern
Chrysophyllum oliveform	Satin leaf	*Pteris* sp.	Fern
Cirsium sp.	Thistle	*Pteris vittata*	Brake fern
Cladium jamaicense	Sawgrass	*Pteridium aquilinum (var. caudatum)*	Braken fern
Coccoloba uvifera	Sea grape	*Randia aculeata*	Indigo berry
Coccothrinax argentata	Silver palm	*Rhoeo spathacea*	Oyster plant
Crossopetalum ilicifolium	Christmas berry	*Rhus copallina*	Winged sumac

Table G-1

HARB Master Plant List (Native and Non-Native Species)

Scientific Name	**Common Name**	***Scientific Name***	**Common Name**
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
Cynodon dactylon	Bermuda grass	*Sabal minor*	Blue stem
Cyperus sp.	Umbrella sedge	*Sabal palmetto*	Cabbage palm
Desmodium sp.	Tick trefoil	*Sabatia grandiflora*	Large-flowered sabatia
Dipholis salicifolia	Willow bustic	*Sachsia bahamensis*	Bahama sachsia
Dodonaea viscosa	Varnish leaf	*Sagittaria lancifolia*	Duck potato
Eleocharis cellulosa	Spike rush	*Samolus ebracteatus*	Water pimpernel
Equisetum sp.	Horsetail	*Schinus terebinthifolius*	Brazilian pepper
Eugenia axillaris	White stopper	*Schizachyrium rhizomatum*	Florida Bluestem
Eupatorium capillifolium	Dog fennel	*Schoenus nigricans*	Black rush
Eupatorium coelestinum	Ageratum	*Scutellaria havanensis*	Skullcap
Eupatorium odoratum	Boneset	*Selaginella sp.*	Moss
Ficus aurea	Strangler fig	*Senna bicapsularis*	Butterfly bush
Ficus citrifolia	Shortleaf fig	*Serenoa repens*	Saw palmetto
Fimbristylis cymosa (var. spathacea)	Hurricane grass	*Setaria lutescens (or parviflora)*	Foxtail
Flaveria linearis	Yellowtop	*Sisyrinchium atlanticum*	Blue-eyed grass
Forstiera segregata var *pinetorum*	Florida privet	*Smilax laurifolia*	Bamboo vine or catbrier
Guapira discolor	Beef tree	*Smilax havanensis*	Greenbrier
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	*Sphenomeris clavata*	Wedgelet fern
Ilex cassine	Dahoon holly	*Stenotaphrum secundatum*	St. Augustine Grass
Ilex krugiana	Krug's holly	*Stachytarphetta jamaicensis*	Blue porterweed
Ipomoea hederifolia	Morning glory	*Swietenia mahagoni*	Mahogany
Ipomoea microdactyla	Wild potato morning glory	*Tetrazygia bicolor*	Tetrazygia
Jacquemontia curtissii	Pineland jacquemontia	*Tragia saxicola*	Rocklands noseburn
Lantana camara	Shrub verbena	*Trema lamarckiana*	West Indian trema
Lantana depressa	Florida lantana	*Trema micranthum*	Florida trema
Lantana involucrata	Wild sage	*Toxicodendron radicans* ssp *radicans*	Poison ivy
Leucaena leucocephala	Leadtree	*Typha domingensis*	Southern cattail
Linum arenicola	Sand flax	*Vernonia blodgettii*	Blodgett's ironweed
Linum carteri	Everglades flax	*Vitis rotundifolia*	Muscadine grape
Lippia nodiflora	Cape weed	*Waltheria indica*	Uhaloa
Magnolia sp.	Magnolia	*Wedelia trilobata*	Creeping ox-eye
Melaleuca quinquenervia	Melaleuca	*Zeuxine strateumatica*	Lawn orchid

Source: E & E 2002b; PBS&J 1998; Argonne 1997; and Hilsenbeck 1993.

Table G-2

Federally Designated Plant Species in Miami-Dade County

Federal Status	Common Name	Species Name	Habitat Preference or Requirements[a]	Habitat Occurrence Probability on HARB
E[b]	Crenulate lead-plant	*Amorpha crenulata*	Pine rockland and marl prairie.	Medium
C	Blodgett's silverbush	*Argythamnia blodgettii*	Pine rockland, rockland hammock and edge, coastal rock barren, disturbed upland.	Medium
C	Florida brickell-bush	*Brickellia mosieri*	Pine rockland.	Medium
E	Deltoid spurge	*Chamaesyce deltoidea* ssp. *deltoidea*	Pine rockland.	Medium
C	Pineland sandmat	*Chamaesyce deltoidea* ssp. *pinetorum*	Pine rockland.	Medium
T	Garber's spurge	*Chamaesyce garberi*	Pine rockland, beach dune and coastal rock barren.	Medium
C	Florida prairie clover	*Dalea carthagenensis* var.*floridana*	Pine rockland, rockland hammock edge, marl prairie, coastal strand.	Medium
C	Florida pineland crabgrass	*Digitaria pauciflora*	Marl prairie and pine rockland.	Medium
E[b]	Small's milkpea	*Galactia smallii*	Pine rockland.	Medium*
T	Johnson's seagrass	*Halophila johnsonii*	Marine waters.	Low
E[b]	Beach jacquemontia	*Jacquemontia reclinata*	Coastal strand.	Low
C	Carter's small-flowered flax	*Linum carteri* var. *carteri*	Pine rockland and disturbed upland.	Medium
E	Tiny polygala	*Polygala smallii*	Pine rockland, disturbed upland, sandhill, scrub, and scrubby flatwoods.	Medium
E	Carter's mustard	*Warea carteri*	Pinelands, scrub, and sandhills (believed extirpated in Miami-Dade County).	Low

Source: USFWS 1999.

[a] Habitat requirements derived from the Floristic Inventory of South Florida Database (Institute for Regional Conservation 2001).

[b] Species listed with an asterisk are also described in the multi-species recovery plan (USFWS 1999).

* Small's milkpea recently confirmed to be within former HAFB (non-HARB) property in May 2009.

Key: E = Endangered.
T = Threatened.
C = Candidate.

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Table G-3

State-Listed Plant Species in Miami-Dade County

State Status	Common Name	Species Name	Habitat Type	Habitat Occurrence Probability on HARB
T	Barbed-wire cactus	*.Acanthocereus pentagonus*	Maritime hammocks and beaches.	Low
T	Everglades palm	*Acoelorraphe wrightii*	Hammocks and savannas.	Medium
T	Golden leather fern	*Acrostichum aureum*	Coastal hammocks and tidal marsh.	Low
T	Pineland golden	*Angadenia berteroi*	Pinelands	Medium
T	Pine-pink orchid	*Bletia purpurea*	Pinelands (especially in rocky crevices) and cypress strand.	High
T	Locust berry	*Byrsonima lucida*	Pine rocklands, rockland hammock and edges.	High
T	Pale lidflower	*Calyptranthes pallens*	Hammocks.	Medium
T	Rocklands spurge	*Chamaesyce pergamena*	Pinelands.	Medium
T	White sunbonnets	*Chaptalia albicans*	Pinelands.	Medium
T	Satin leaf	*Chrysophyllum oliviforme*	Hammocks, thickets and pinelands.	High
T	Silver palm	*Coccothrinax argentata*	Pine rocklands, hammocks, and coastal strand.	High
T	Large-flowered rosemary	*Conradina grandiflora*	Scrub, scrubby flatwoods, coastal strand, and disturbed areas (believed extirpated in Miami-Dade County).	Low
T	Christmas berry	*Crossopetalum ilicifolium*	Pine rockland, rockland hammocks, and sinkhole rims.	High
T	Rhacoma	*Crossopetalum rhacoma*	Pine rocklands, rockland hammocks, and coastal strand.	Medium
T	Blodgett's swallowwort	*Cynanchum blodgettii*	Hammocks.	Medium
T	Caribbean crabgrass	*Digitaria dolichophylla*	Pinelands.	Medium
T	Guiana plum	*Drypetes lateriflora*	Hammocks.	Medium
T	Black torch	*Erithalis fruticosa*	Sand dunes and coastal hammocks.	Low
T	Non-crested eulophia	*Eulophia ecristata*	Sand pine scrub, sandhills, and pine rockland.	Medium
T	Krug's holly	*Ilex krugiana*	Rockland hammocks and pinelands.	High
T	Pineland jacquemontia	*Jacquemontia curtissii*	Pine rocklands, marl prairie, spoil banks, and mesic flatwoods.	High
T	Joewood	*Jacquinia keyensis*	Coastal strand, coastal grassland, maritime hammocks, and rocky pineland.	Medium
T	Wild dilly	*Manilkara jaimiqui*	Hammocks.	Medium
T	Mayten	*Maytenus phyllanthoides*	Hammocks and dunes.	Medium
T	Small-leaved melanthera	*Melanthera parvifolia*	Mowed pine rocklands and marl prairies.	High

Table G-3

State-Listed Plant Species in Miami-Dade County

State Status	Common Name	Species Name	Habitat Type	Habitat Occurrence Probability on HARB
T	Simpson's stopper	*Myrcianthes fragrans*	Hammocks.	Medium
T	Giant sword fern	*Nephrolepis biserrata*	Mesic hammocks, roadside, clearings, and swamps.	Medium
T	Shell mound prickly-pear	*Opuntia stricta*	Shell mounds and coastal areas.	Low
T	Blackbead	*Pithecellobium keyense*	Hammocks, pinelands, and sand dunes adjacent to beaches.	Medium
T	Snowy orchid	*Platanthera nivea*	Bogs, wet pine savannas, flatwoods, and wet prairies.	Medium
T	West Indian cherry	*Prunus myrtifolia*	Hammocks.	Medium
T	Mangrove berry	*Psidium longipes*	Hammocks and pinelands.	Medium
T	Bahama ladder brake fern	*Pteris bahamensis*	Limestone pockets in pine rockland and edges of hammocks.	High
T	Darling plum	*Reynosia septentrionalis*	Hammocks.	Medium
T	Small-leaf snoutbean	*Rhynchosia parvifolia*	Pinelands, along trails, and beaches.	Medium
T	Bahama sachsia	*Sachsia bahamensis*	Pine rocklands.	High
T	Inkberry	*Scaevola plumieri*	Coastal strand.	Low
T	Chapman's sensitive	*Senna mexicana*	Pinelands, hammocks, and coastal dunes.	Medium
T	Everglades greenbrier	*Smilax havanensis*	Pinelands and hammocks.	Medium
T	Potato tree	*Solanum donianum*	Hammocks and lime sinks in pinelands.	Medium
T	False buttonweed	*Spermacoce terminalis*	Pinelands and coastal areas.	Medium
T	Lace-lip ladies' tresses	*Spiranthes laciniata*	Shores swamps, marshes, flatwoods, and wet sandy soil.	Medium
T	Long-lip ladies' tresses	*Spiranthes longilabris*	Prairies, flatwoods, marshes, and sandy bogs.	Medium
T	Leafless beaked orchid	*Stenorrhynchos lanceolatus*	Open pastures, roadside, wet pine Flatwoods, and sandhills.	Medium
T	Mahogany	*Swietenia mahagoni*	Maritime and rockland hammocks.	High
T	Broad halberd fern	*Tectaria heracleifolia*	Rockland hammocks.	Medium
T	Tetrazygia	*Tetrazygia bicolor*	Rockland hammocks, pinelands, and disturbed areas.	High
T	Abrupt-tipped maiden fern	*Thelypteris augescens*	Hammocks, sides of lime sinks, and abandoned phosphate mines.	Medium
T	Inflated wildpine	*Tillandsia balbisiana*	Hammocks, cypress swamps, pineland, and scrub.	Medium
T	Twisted or banded air plant	*Tillandsia flexuosa*	Shell ridges or mounds, hammock, swamps, mangrove, pinelands, and scrub.	Medium
T	Soft-leaved wildpine	*Tillandsia valenzuelana*	Hammocks and swamps.	Medium
T	Rocklands noseburn	*Tragia saxicola*	Pine rocklands.	High

Table G-3

State-Listed Plant Species in Miami-Dade County

State Status	Common Name	Species Name	Habitat Type	Habitat Occurrence Probability on HARB
T	Florida tripsacum	*Tripsacum floridanum*	Pine rocklands.	Medium
T	Tamarindillo	*Acacia choriophylla*	Rockland hammock, marine tidal swamp, and coastal berm.	Medium
E	Fragrant maidenhair fern	*Adiantum melanoleucum*	Rockland hammocks and limestone sinkholes.	Medium
E	Brittle maidenhair fern	*Adiantum tenerum*	Sink walls, grottos, and limestone ledges.	Medium
E	Meadow jointvetch	*Aeschynomene pratensis*	Pineland margins.	Medium
E	Bracted colic-root	*Aletris bracteata*	Pine rocklands and marl prairies.	Medium
E	Alvaradoa	*Alvaradoa amorphoides*	Pine rocklands and rockland hammocks.	Medium
E	Parsley fern	*Anemia wrightii*	Rockland hammocks.	Medium
E	Sea-lavender	*Argusia gnaphalodes*	Coastal dunes and coastal rock barrens.	Low
E	Blodgett's wild-mercury	*Argythamnia blodgettii*	Pine rocklands, wet margins, and openings of hammock and coastal rock barrens.	Medium
E	Marsh's Dutchman's	*Aristolochia pentandra*	Hammocks.	Medium
E	Auricled spleenwort	*Asplenium auritum*	On trunks of large trees, mostly live oaks in mesic hammocks and strand swamp.	Low
E	Slender spleenwort	*Asplenium dentatum*	Rockland hammocks, especially on rock walls in grottos.	Medium
E	Bird's-nest spleenwort	*Asplenium serratum*	Fallen logs in swamps and hammocks.	Medium
E	Delicate spleenwort	*Asplenium verecundum*	Limestone in grottos, on cliffs and boulders in shaded woods.	Medium
E	Broombush falsewillow	*Baccharis dioica*	Hammocks and dune hollows (believed extirpated).	Low
E	Carter's orchid	*Basiphyllaea corallicola*	Shallow pockets in rock of pine rockland.	Medium
E	Little strongback	*Bourreria cassinifolia*	Pine rocklands.	Medium
E	Pigeon-berry	*Bourreria succulenta*	Hammocks.	Medium
E	Spider orchid	*Brassia caudate*	Rockland hammocks (believed extirpated in Miami-Dade County).	Low
E	Brickell-bush	*Brickellia mosieri*	Pine rocklands and sandy soil over limestone	Medium
E	Yellow nicker	*Caesalpinia major*	Coastal sands and hammocks.	Medium
E	Many-flowered grass-pink	*Calopogon multiflorus*	Damp pinelands and meadows (believed extirpated in Miami-Dade County).	Low
E	Myrtle-of-the-river	*Calyptranthes zuzygium*	Rockland hammocks and maritime hammocks.	Medium
E	Narrow swamp fern	*Campyloneurum angustifolium*	Rockland hammocks and strand swamps (believed extirpated in Miami-Dade County).	Low

Table G-3

State-Listed Plant Species in Miami-Dade County

State Status	Common Name	Species Name	Habitat Type	Habitat Occurrence Probability on HARB
E	Key cassia	*Cassia keyensis* (= *Chamaecrista lineata* var. *keyensis*)	Pine rocklands.	Medium
E	Airplant	*Catopsis berteroniana*	Tidal swamp and rockland hammocks.	Medium
E	Many-flowered airplant	*Catopsis floribunda*	Strand swamp and rockland hammocks.	Medium
E	West Indian cock's- comb	*Celosia nitida*	Hardwood hammocks and coastal dunes	Low
E	Porter's spurge	*Chamaesyce porteriana*	Pine rocklands, rockland hammock, coastal grassland, coastal strand, and coastal rock barrens.	High
E	Southern lip fern	*Cheilanthes microphylla*	Upland mixed forest, shell mounds, and limestone Outcrop in Cedars.	Medium
E	Pareira brava	*Cissampelos pareira*	Hammocks (believed extirpated).	Low
E	Colubrina	*Colubrina cubensis*	Hammocks and pinelands.	Medium
E	Soldierwood	*Colubrina elliptica*	Hammocks.	Medium
E	Curaçao bush	*Cordia globosa*	Hammocks.	Medium
E	Moss orchid	*Cranichis muscosa*	Rockland hammocks (believed extirpated in Miami-Dade County).	Low
E	Pepperbush	*Croton humilis*	Hammocks and disturbed sites.	Medium
E	Florida tree fern	*Ctenitis sloanei*	Limestone ledges, rockland hammocks, and cypress strand swamps.	Medium
E	Cupania	*Cupania glabra*	Rockland hammocks.	Medium
E	Florida flatsedge	*Cyperus floridanus*	Sandy soil.	Medium
E	Cowhorn or cigar orchid	*Cyrtopodium punctatum*	Rockland hammocks, marl prairie, and strand swamp.	Medium
E	Brown's Indian rosewood	*Dalbergia brownii*	Margins of hammocks or mangroves and roadsides.	Medium
E	Florida prairie clover	*Dalea carthagenensis*	Pineland hammocks.	Medium
E	Florida pineland crabgrass	*Digitaria pauciflora*	Pine rocklands and marl prairie.	Medium
E	Milkbark	*Drypetes diversifolia*	Hammocks.	Medium
E	Beaked spikerush	*Eleocharis rostellata*	Prairies and swamps.	Medium
E	Spurred neottia	*Eltroplectris calcarata*	Dense hammocks.	Medium
E	Dollar orchid	*Encyclia boothiana*	Low limbs of trees in hammocks or thickets and marine tidal swamps.	Medium
E	Florida clamshell orchid	*Encyclia cochleata*	Rockland hammocks, dome swamps, and strand swamps.	Medium

Table G-3

State-Listed Plant Species in Miami-Dade County

State Status	Common Name	Species Name	Habitat Type	Habitat Occurrence Probability on HARB
E	Night-scented epidendrum	*Epidendrum nocturnum*	Rockland hammocks, strand swamps, and dome swamps.	Medium
E	Rigid epidendrum	*Epidendrum rigidum*	Swamps and strand swamps.	Medium.
E	One-nerved cokeri	*Ernodea cokeri*	Pine rocklands.	High
E	Redberry eugenia).	*Eugenia confusa*	Rockland hammocks.	Medium
E	Red stopper	*Eugenia rhombea*	Rockland hammocks.	Medium
E	Keys' thoroughwort	*Eupatorium villosum*	Hammocks and pine woods.	Medium
E	Dwarf bindweed	*Evolvulus convolvuloides*	Coastal areas on limestone or coral rock.	Low
E	Helmet orchid	*Galeandra beyrichii*	Edges of sinkholes in rockland hammock.	Medium
E	Wild cotton	*Gossypium hirsutum*	Coastal hammocks, shell mounds, and coastal berm.	Low
E	Gowen's orchid	*Govenia utriculata*	Rockland hammocks.	Medium
E	Lignum vitae	*Guaiacum sanctum*	Rockland hammocks.	Medium
E	Fuch's bromeliad	*Guzmania monostachia*	Rockland hammocks, strand swamp.	Medium
E	West Indian false-box	*Gyminda latifolia*	Hammocks.	Medium
E	West coast prickly-apple	*Harrisia simpsonii*	Maritime hammocks and shell middens.	Low
E	Poeppig's rose-mallow	*Hibiscus poeppigii*	Hammocks.	Medium
E	Manchineel	*Hippomane mancinella*	Coastal berm, rockland hammocks, maritime hammocks, and tidal swamp borders.	High
E	Inkwood	*Hypelate trifoliata*	Rockland hammocks and pine rockland.	Medium
E	Wild-potato morning-glory	*Ipomoea microdactyla*	Pine rocklands and vacant lots.	High
E	Rocklands morning-glory	*Ipomoea tenuissim*	Pine rocklands.	Medium
E	Havana clustervine	*Jacquemontia havanensis*	Hammocks.	Medium
E	Skyblue clustervine	*Jacquemontia pentantha*	Hammocks.	Medium
E	Hammock shrub verbena	*Lantana canescens*	Hammocks.	Medium
E	Pineland lantana	*Lantana depressa*	Pine rockland, coastal strand, coastal grasslands, beach berm, and marl prairies.	High
E	Spreading pinweed	*Lechea divaricata*	Dry sandy soil and scrubby flatwoods.	Medium
E	Parasitic ghostplant	*Leiphaimos parasitica*	Hammocks.	Medium
E	Licaria	*Licaria triandra*	Rockland hammocks.	Medium
E	Sand flax	*Linum arenicola*	Pine rocklands.	High
E	Everglades flax	*Linum carteri*	Mowed pine rockland, roadside, and marl prairies.	High

Table G-3

State-Listed Plant Species in Miami-Dade County

State Status	Common Name	Species Name	Habitat Type	Habitat Occurrence Probability on HARB
E	Tall twayblade orchid	*Liparis nervosa*	Cypress swamps and rich humus of hammocks (believed extirpated in Miami-Dade County).	Low
E	Climbing holly-fern	*Lomariopsis kunzeana*	Limestone sinkholes in rockland hammocks.	Medium
E	Trinidad macradenia	*Macradenia lutescens*	Rockland hammocks (believed extirpated in Miami-Dade County).	Low
E	Florida spiny pod	*Matelea floridana*	Bluffs and pine-oak-hickory woods (introduced in Miami-Dade County).	Low
E	Climbing vine fern	*Microgramma heterophylla*	Rockland hammocks.	Medium
E	Ribbon fern	*Neurodium lanceolatum*	Hammocks and mangrove swamps.	Medium
E	Ocimum	*Ocimum campechianum*	Disturbed sites	Medium
E	Burrowing four-o'clock	*Okenia hypogaea*	Ocean side of coastal dunes.	Low
E	Florida oncidium	*Oncidium floridanum*	Rockland hammocks.	Medium
E	Mule-ear orchid	*Oncidium luridum*	Buttonwood hammocks, strand swamps, and coastal berms.	Low
E	Hand fern	*Ophioglossum palmatum*	Grows at the base of cabbage palm leaves in hydric hammocks and strand swamps.	Medium
E	White-flowered passionvine	*Passiflora multiflora*	Hammocks.	Medium
E	Pineland passionvine	*Passiflora pallens*	Hammocks.	Medium
E	Goat's foot leaf	*Passiflora sexflora*	Hammocks.	Medium
E	Swampbush	*Pavonia paludicola*	Mangroves and seashore marshes	Low
E	Clasping peperomia	*Peperomia amplexicaulis*	Hammocks (believed extirpated).	Low
E	Peperomia	*Peperomia humilis*	Maritime hammocks, upland hardwood, and swamp.	Medium
E	Spathulate peperomia	*Peperomia magnoliifolia*	Hammocks (believed extirpated).	Low
E	Florida peperomia	*Peperomia obtusifolia*	Rockland hammocks and strand swamps.	Medium
E	Southern matchsticks	*Phyla stoechadifolia*	Low pineland and swamps.	Medium
E	Florida bitterbush	*Picramnia pentandra*	Coastal hammocks.	Low
E	Everglades poinsettia	*Poinsettia pinetorum* (=*Euphorbia pinetorum*)	Sandy marshes and pine rocklands.	High
E	Widespread polypody	*Polypodium dispersum*	Hammocks (believed extirpated in Miami-Dade County).	Low
E	Plume polypody	*Polypodium plumula*	Hammocks.	Medium
E	Swamp plume polypody	*Polypodium ptilodon*	Hammocks and swamps.	Medium

Table G-3

State-Listed Plant Species in Miami-Dade County

State Status	Common Name	Species Name	Habitat Type	Habitat Occurrence Probability on HARB
E	Ghost orchid	*Polyrrhiza lindenii*	On shrubs and trees in maritime hammocks, river swamps and wet forests (believed extirpated in Miami-Dade County).	Low
E	Pale-flowered polystachya	*Polystachya concreta*	Strand swamps.	Low
E	Mrs. Britton's shadow witch	*Ponthieva brittoniae*	Pine rocklands.	Medium
E	Small-flowered orchid	*Prescottia oligantha*	Rockland hammocks.	Medium
E	Sargent's cherry palm	*Pseudophoenix sargentii*	Rocklands hammocks near sea level on limestone or sand where protected from wind.	Medium
E	Bahama wild coffee	*Psychotria ligustrifolia*	Hammocks and pineland.	Medium
E	Beach-star	*Remirea maritima*	Coastal dunes.	Low
E	Mistletoe cactus	*Rhipsalis baccifera*	On mangroves and button wood in tidal swamps.	Low
E	Swartz' snoutbean	*Rhynchosia swartzii*	Hammocks.	Medium
E	Florida royal palm	*Roystonea elata*	Rockland hammocks, shell middens, and strand swamp.	Medium
E	Maiden bush	*Savia bahamensis*	Hammocks and low areas.	Medium
E	Florida boxwood	*Schaefferia frutescens*	Hammocks.	Medium
E	Ray fern	*Schizaea germanii*	Low hammocks (believed extirpated from Miami-Dade County).	Low
E	Keys' nutrush	*Scleria lithosperma*	Pine rockland hammocks.	Medium
E	Havana skullcap	*Scutellaria havanensis*	Pinelands.	Medium
E	Pygmy spikemoss	*Selaginella eatonii*	Sinkholes in pine rocklands.	Medium
E	Coral panic grass	*Setaria chapmanii*	Cleared areas, cultivated fields, shell mounds, hammocks, prairies and bay shores.	Medium
E	Wedgelet fern	*Sphenomeris clavata*	Limestone sinks in rock pinelands.	High
E	Pelexia	*Spiranthes adnata*	Rockland hammocks.	Medium
E	Costa Rican ladies'-tresses	*Spiranthes costaricensis*	Rockland hammocks.	Medium
E	Tall neottia	*Spiranthes elata*	Solution holes in rockland hammocks and hammocks (believed extirpated in Miami-Dade County).	Medium
E	Ft. George ladies'-tresses	*Spiranthes polyantha*	Rockland hammocks	Medium
E	Southern ladies'-tresses	*Spiranthes torta*	Rockland pinelands and marl prairies.	Medium
E	Everglades pencil flower	*Stylosanthes calcicola*	Pinelands and margins.	Medium
E	Least halberd fern	*Tectaria fimbriata*	Sinkhole ledges.	Medium

Table G-3

State-Listed Plant Species in Miami-Dade County

State Status	Common Name	Species Name	Habitat Type	Habitat Occurrence Probability on HARB
E	Grid-scale maiden fern	*Thelypteris patens*	Rockland hammocks.	Medium
E	Creeping star-hair fern	*Thelypteris reptans*	Limestone rocks, grottoes, rockland hammocks, and upland mixed forests.	Medium
E	Lattice-vein fern	*Thelypteris reticulata*	Hammocks in cypress swamps and wet roadsides	Medium
E	Stiff star-hair fern	*Thelypteris sclerophylla*	On limestone in rockland hammocks.	Medium
E	Dentate lattice-vein fern	*Thelypteris serrata*	Pond apple and pop ash hammocks, guava groves, cypress slough and swamps.	Medium
E	Brittle thatch palm	*Thrinax morrisii* (= *T. microcarpa*)	Pine rockland and hammocks.	Medium
E	Florida thatch palm	*Thrinax radiata* (= *T. floridana*)	Hammocks, coastal strand and shores.	Medium
E	Common wild-pine	*Tillandsia fasciculata*	Hammocks, cypress swamps, and pinelands.	Medium
E	Chiggery-grapes	*Tournefortia hirsutissima*	Hammocks.	Medium
E	Lamark's trema	*Trema lamarckianum*	Hammocks, disturbed areas, and roadsides.	Medium
E	Kraus's bristle fern	*Trichomanes krausii*	Limestone sinks in rockland hammocks and at the base of tree trunks.	Medium
E	Lined bristle fern	*Trichomanes lineolatum*	Limestone sinks (believed extirpated).	Low
E	Florida bristle fern	*Trichomanes punctatum*	Limestone sinks in rockland hammocks.	Medium
E	Young-palm orchid	*Tropidia polystachya*	Dense tropical hammocks (believed extirpated).	Low
E	Worm-vine orchid	*Vanilla barbellata*	Prairies, tidal swamps, and hammocks.	Medium
E	Dillon's vanilla	*Vanilla dilloniana*	Rockland hammocks (believed extirpated).	Low
E	Unscented vanilla	*Vanilla mexicana*	Bayhead and baygalls (believed extirpated in Miami-Dade County).	Low
E	Coastal vervain	*Verbena maritima*	Coastal dunes, coastal strand, and pine rocklands.	Medium
E	Leathery prickly-ash	*Zanthoxylum coriaceum*	Tropical hammocks and sandy beaches.	Medium

Sources: FDACS 2000 and Coile 2000.

Key: E = Endangered.
T = Threatened.

Table G-4

Federally Designated Wildlife Species in Miami-Dade County

Federal Status	Common Name	Species Name	Habitat Preference or Requirements	Habitat Potential on HARB
Mammals				
E	Florida panther	*Puma concolor coryi*	Hardwood hammock and pine Flatlands.	Low
E	West Indian manatee	*Trichechus manatus*	Coastal and inland waterways.	Low
Fish				
E	Smalltooth Sawfish	*Pristis pectinata*	Shallow coastal estuarine habitats.	Low
Birds				
T	Bald eagle	*Haliaeetus leucocephalus*	Appropriate nesting and perch areas near large, open waterbodies.	**Regular winter visitor**
E	Cape Sable seaside sparrow	*Ammodramus maritimus mirabilis*	Short hydroperiods and dry marl prairie.	Low
E	Everglade snail kite	*Rostrhamus sociabilis plumbeus*	Freshwater marshes and lakes that support apple snail populations.	Low
T	Roseate tern	*Sterna dougallii dougallii*	Nearshore marine waters and beaches.	Low
E	Wood Stork	*Mycteria americana*	Marshes, cypress swamps, and mangrove wwamps.	**Regular winter visitor**
T	Piping Plover	*Charadrius melodus*	Beaches, mudflats and sandflats.	Low
Reptiles				
E	American crocodile	*Crocodylus acutus*	Mangrove swamps and low-energy bays, creeks and inland wwamps.	**On base resident since 2007**
T	Eastern indigo snake	*Drymarchon carais couperi*	Pine flatwoods, pine rocklands, and tropical Hardwood hammocks.	Medium
E	Green sea turtle	*Chelonia mydas*	High-energy beaches, pelagic habitat, and shallow marine waters.	Low
E	Hawksbill sea turtle	*Eretmochelys imbricata*	High-energy beaches, pelagic habitat, and shallow marine waters.	Low
E	Leatherback sea turtle	*Dermochelys coriacea*	High-energy beaches and pelagic habitat.	Low
T	Loggerhead sea turtle	*Caretta caretta*	High-energy beaches, pelagic habitat, and shallow marine waters.	Low
Invertebrate				
E	Schaus swallowtail butterfly	*Heraclides aristodemus ponceanus*	Restricted to tropical Hardwood hammocks in Biscayne National Park and Key Largo only.	Low

Source: USFWS 1999.

Key: E = Endangered
T = Threatened
C = Candidate

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Table G-5

State-Listed Wildlife Species in Miami-Dade County

State Status	Common Name	Species Name	Habitat Type	Habitat Potential on HARB
Birds				
SSC	Roseate spoonbill	*Ajaia ajaja*	Coastal strand, marshes and sloughs.	Low
SSC	Limpkin	*Aramus guarauna*	Freshwater wetlands.	High
T	White-crowned pigeon	*Columba leucocephala*	Primarily in mangrove forests.	Low
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	Tricolor 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
SSC	Brown pelican	*Pelecanus occidentalis*	Near shore marine waters and coastal islands.	Low
SSC	Black skimmer	*Rynchops niger*	Estuaries and coastlines.	Low
SSC	Florida burrowing owl	*Athene cunicularia floridana*	Grasslands and other open areas.	High
T	Least tern	*Sterna antillarum*	Open, flat beach areas.	High
Mammals				
E	Florida mastiff bat	*Eumops glaucinus floridanus*	Buildings and tree cavities in hardwood hammocks.	Low
T	Southern mink	*Mustela vison*	Shallow wetlands and marshes.	Low
SSC	Florida mouse	*Podomys floridanus*	Scrub and sand hill 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
Amphibian				
SSC	Gopher frog	*Rana capito*	Native, xeric, shrub habitat associated with the gopher tortoise.	Low
Reptiles				
SSC	American alligator	*Alligator mississippiensis*	Primarily freshwater swamps and marshes.	High
SSC	Gopher tortoise	*Gopherus polyphemus*	Xeric scrub oak, coastal strand and dune, live oak hammocks, dry prairie, pine Flatwoods, and mixed hardwood-pine communities.	Low

Table G-5

State-Listed Wildlife Species in Miami-Dade County

State Status	Common Name	Species Name	Habitat Type	Habitat Potential on HARB
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 2002, Mazzotti and Hudson Kelly 2001, Kale 1978, USDA 2002, O'Meara and Gore 1988, and Peterla 2002.

Note:

[a] Refers to the Everglades population only; species formerly listed as *Mustela vison evergladensis*.

Key: E = Endangered
T = Threatened
SSC = Species of Special Concern

Appendix H

Environmental Assessment for Implementation of the Updated Integrated Natural Resources Management Plan

Homestead Air Reserve Base, Homestead, Florida

Table of Contents

Appendix

List of Tables

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List of Acronyms and Abbreviations

ACC	Air Combat Command
AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
AFI	Air Force Instruction
AFPD	Air Force Policy Directive
AFRC	Air Force Reserve Command
AOCs	Areas of concern
BNP	Biscayne National Park
CAA	Clean Air Act
CDMP	Comprehensive Development Master Plan
CEQ	Council on Environmental Quality
DoD	Department of Defense
EA	environmental assessment
F.A.C.	Florida Administrative Code
FAA	Federal Aviation Administration
FDEP	Florida Department of Environmental Protection
FDNR	Florida Department of Natural Resources
FNAI	Florida Natural Areas Inventory
FONSI	Finding of no significant impact
gpm	gallons per minute
HARB	Homestead Air Reserve Base
HARS	Homestead Air Reserve Station
INRMP	Integrated Natural Resources Management Plan
IRP	Installation Restoration Program
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act

List of Acronyms and Abbreviations, Continued

NGVD	National Geodetic Vertical Datum
NPS	National Park Service
PM	Particulate matter
SAIA	Sikes Act Improvement Act (1997)
SFRPC	South Florida Regional Planning Council
SFWMD	South Florida Water Management District
SIP	State Implementation Plan
TSP	Total suspended particulates
U.S.C.	United States Code
UDB	urban development boundary
UEA	urban expansion area
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USDA NRCS	United States Department of Agriculture Natural Resources Conservation Service
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VOCs	Volatile organic compounds
WRAP	wetlands rapid assessment procedure

1 Introduction and Background

1.1 Introduction

This environmental assessment (EA) has been developed for use by the United States Air Force Reserve Command (AFRC) in accordance with 32 Code of Federal Regulations (CFR) 989, as amended, the United States Air Force (USAF) *Environmental Impact Analysis Process* and Air Force Policy Directive (AFPD) 32-70 *Environmental Quality*.

As part of its mission, the USAF has chosen to be a leader in environmental and natural resources stewardship both now and in the future. This dedication and commitment to natural resources management is demonstrated by the development and implementation of an Integrated Natural Resources Management Plan (INRMP). This EA was prepared to implement the *Homestead Air Reserve Base, INRMP, Homestead, Florida* (referred to hereafter as the "HARB INRMP"). This INRMP is a dynamic document that will be maintained and adapted, as necessary, to reflect updated natural resources information.

1.2 Location and Mission

HARB is located near the southern tip of the Florida peninsula, approximately 20 miles south- southwest of the city of Miami, and adjacent to the eastern boundary of the city of Homestead, and 2.0 miles inland from Biscayne Bay and the Atlantic Ocean. The primary mission of HARB is to provide a facility for peacetime training of reservists in the 482nd Fighter Wing who maintain and operate HARB. Additional functions of HARB are to maintain and operate facilities; to provide administrative and logistic support to tenant activities; and to perform other such functions and tasks as assigned.

1.3 Summary of Key Environmental Compliance Requirements

1.3.1 National Environmental Policy Act of 1969

The National Environmental Policy Act (NEPA), is a federal statute requiring the identification and analysis of potential environmental impacts of proposed federal actions before those actions are implemented. NEPA established the Council on Environmental Quality (CEQ) that is charged with the development of implementing regulations and ensuring agency compliance with NEPA. CEQ regulations mandate that all federal agencies use a systematic interdisciplinary approach to environmental planning and the evaluation of actions that may affect the environment. This process evaluates potential environmental consequences associated with a proposed action and considers alternative courses of action. The intent of NEPA is to protect, restore, or enhance the environment through informed federal decisions.

1.3.2 INRMP and NEPA Integration

To comply with NEPA, the planning and decision-making process for implementing federal actions involves a study of other relevant environmental statutes and regulations. The NEPA process, however, does not replace the procedural or substantive requirements of other environmental statutes and regulations. It addresses these requirements collectively in the form of an EA or an environmental impact statement, providing the decision-maker a comprehensive view of major environmental issues and requirements associated with the Proposed Action.

1.4 Interagency and Public Coordination and Review

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. Government and non-government input was provided in the development of the INRMP. The INRMP was produced with the technical assistance and additional guidance on regional issues from representatives of the United States Fish and Wildlife Service (USFWS) and the Florida Fish and Wildlife Conservation Commission, Miami-Dade County Department of Environmental Resource Management, Miami-Dade Natural Areas Management, and the National Park Service.

Public and concerned organizations, including minority and low-income, disadvantaged, and Native American groups, will be notified of the findings and conclusions of this EA by an announcement of the availability of a finding of no significant impact (FONSI) in the local

newspapers and by the availability of the EA and the HARB INRMP for public review for 30 days. A copy of the FONSI, INRMP, and the EA will be made available for public review at the Homestead branch of the Miami-Dade County Library at 700 N. Homestead Boulevard in the City of Homestead. Inquiries regarding the aforementioned documents should be directed to the Public Affairs Office at: 482 FW/PA, 29050 Coral Sea Boulevard, P.O. Box 46, Homestead ARB, FL 33039-1299.

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2 Description of the Proposed Action and Alternatives

2.1 Purpose and Need

The USAF is responsible for the conservation of natural and cultural resources on its bases through effective environmental planning. It is USAF policy (AFPD 32-70) to restore, improve, preserve, and properly utilize natural resources and otherwise comply with all applicable state and federal environmental statues, regulations, and policies within the constraints of the military mission.

The purpose of the updated INRMP is to meet statutory requirements under the Sikes Act Improvement Act (SAIA) of 1997. In November 1997, the Sikes Act, 16 United States Code (U.S.C.) 670a et seq., was amended to require the Secretary of Defense to carry out a program to provide for the conservation and rehabilitation of natural resources on military bases. To facilitate this program, the amendments require the secretaries of the military departments to prepare and implement INRMPs for each military base in the United States unless the absence of significant natural resources on a particular base makes preparation of a plan for that base inappropriate. The SAIA requires each base to prepare an INRMP that provides for the following management objectives, to the extent that such activities are consistent with use of the base for military preparedness:

- Conservation and rehabilitation of natural resources on the Base;
- The sustainable multipurpose use of the resources, to include hunting, fishing, trapping, and non-consumptive uses; and
- Subject to safety requirements and military security, public access to the Base to facilitate such uses.

As required by the SAIA, the plan must, to the extent appropriate and applicable, provide for:

- Fish and wildlife management, land management, forest management, and fish and wildlife-oriented recreation;

- Fish and wildlife habitat enhancement or modification;
- Wetland protection, enhancement, and restoration, where necessary for support of fish, wildlife, and plants;
- Integration of, and consistency among, the various activities conducted under the plan;
- Establishment of specific natural resources management goals and objectives;
- Sustainable use by the public of natural resources to the extent that the use is not inconsistent with the needs of fish and wildlife resources;
- Public access to military bases that is necessary or appropriate for the sustainable use of natural resources, subject to the requirements necessary to ensure safety and military security;
- Enforcement of applicable natural resources laws (including regulations);
- No net loss in the capability of the Base's lands to support the military mission of the Base; and
- Such other activities as the USAF determine to be appropriate.

2.2 Proposed Action (Implementation of Updated INRMP)

The Proposed Action is to update the existing INRMP and practices at HARB in a manner that is consistent with the military use of the property and the objectives established in the SAIA as mentioned above.

The goal of the INRMP is to implement an ecosystem-based conservation program that provides for conservation and rehabilitation of natural resources in a manner consistent with the military mission; integrates and coordinates management of all natural resources; provides for sustainable multipurpose uses of natural resources; and provides for public access and use of natural resources subject to safety and military security considerations. The INRMP provides for active partnering, information sharing, and participation of all stakeholder parties and moves natural resource management from a reactive philosophy to a proactive one.

Management objectives are to integrate fish and wildlife management, land management, and management for outdoor recreation opportunities, as practicable and consistent with the military mission and established land users within HARB boundaries. The INRMP focuses on a 5-year planning period that is consistent with the timeframe for management measures described in the INRMP. This planning period began in Fiscal Year (FY) 2010 and ends in FY 2014. Additional environmental documentation may be required as projects proposed in the INRMP evolve and/or as

management objectives within the 5-year timeframe are modified due to changes in military mission, Air Force Instructions (AFIs), or federal and state legal requirements.

2.3 Alternatives to the Proposed Action

The development of the proposed management practices for the INRMP included a detailed evaluation of alternative management scenarios. This analysis involved the review of accepted criteria, standards, guidelines, as well as laws and executive orders for natural resources management. Furthermore, the analysis included a comprehensive review of land areas on the Base, resources present, and each of the land areas role within the overall mission of the Base. Once the mission and resources for each land area was evaluated, various resource management scenarios were evaluated to determine the appropriate management measures for each land area.

The No-Action alternative is the continued implementation of the objectives and practices outlined in the existing INRMP developed in 2004. Ongoing practices for management of natural resources at the HARB would continue, and there would be no change to the objectives outlined under the current INRMP. The No-Action alternative serves as a baseline against which federal action can be evaluated.

2.4 Scope of Analysis

The potential environmental effects associated with the Proposed Action and No-Action alternatives are required to be assessed in compliance with NEPA, CEQ regulations, and USAF Instructions. This EA identifies, documents, and evaluates the effects of implementing the HARB INRMP. Section 3.0 of this EA describes the environmental and socioeconomic resources and conditions most likely to be affected by the implementation of this INRMP. Section 4.0 identifies the potential environmental effects associated with the Proposed Action and the No-Action alternatives, as well as mitigation measures where appropriate.

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3 Affected Environment (Baseline)

Section 3.0 describes the environmental and socioeconomic resources and conditions most likely to be affected by implementation of the INRMP, as required by NEPA, CEQ guidelines, and 32 CFR 989. These resources and conditions include the following areas: air quality, noise, land use and socioeconomic conditions, geological resources, water resources, biological resources, cultural resources, and hazardous waste. This section also provides the baseline conditions from which to identify and evaluate environmental and socioeconomic changes.

3.1 Air Quality

The Clean Air Act (CAA), which was last amended in 1990, requires the United States Environmental Protection Agency (USEPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. The USEPA Office of Air Quality Planning and Standards has set NAAQS for six principal pollutants, which are called "criteria" pollutants (USEPA, 2002a). Criteria pollutants include ozone (smog), lead, carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and particulate matter (PM) of 10 microns or less in diameter (PM_{10}). It should be noted that ozone does not occur directly from any source, but results from a series of reactions between oxides of nitrogen (NO_x) and volatile organic compounds (VOCs) in sunlight.

All areas within the state of Florida are designated with respect to the concentrations of each of these six criteria pollutants. The designations include "attainment," in compliance with the standards; "nonattainment," not in compliance with the standards; or "unclassifiable," insufficient data to classify (Florida Department of Environmental Protection [FDEP], 1999).

HARB is located within the Southeast Florida Intrastate Air Quality Control Region (SF-IAQCR). This region consists of Broward, Miami-Dade, Indian River, Martin, Monroe, Okeechobee, Palm Beach, and St. Lucie counties. Ambient air quality within the SF-IAQCR and subsections of it are monitored for NO_x, CO, SO_2, ozone, particulate matter with aerodynamic diameters less than 2.5

microns ($PM_{2.5}$), particulate matter with aerodynamic diameters less than 10 microns (PM_{10}), and total suspended particulate to determine compliance with NAAQS.

Homestead ARB is located adjacent to the city of Homestead within Miami-Dade County, Florida. The County is classified as in attainment with the following air quality standards: CO, SO_x, and PM_{10}. As of June 15th, 2005 Miami-Dade County is no longer subject to the 1 hour standard for ozone. This is on the EPA website at http://www.epa.gov/oar/oaqps/greenbk/oindex.html.

3.2 Noise

Noise is generally defined as unwanted sound and can be any sound that is undesirable because it interferes with communications, has enough intensity to damage hearing or is otherwise annoying. Human response to noise varies, depending on the type and characteristics of the noise, distance between the noise source and receptor, receptor sensitivity, prevailing winds, and time of day.

The day night average sound level (L_{dn}) is the energy-averaged sound level measured by summation and averaging of sound exposure level values during a 24-hour period. L_{dn} is the preferred noise metric of the U.S Department of Housing and Urban Development, Federal Aviation Administration (FAA), USEPA, and Department of Defense (DoD; FICON, 1992).

The noise environment at HARB is dominated by military aircraft operations (aircraft warm-ups, maintenance and testing, taxiings, takeoffs, approaches, and landings). The most recent Air Installation Compatible Use Zone (AICUZ) Study was prepared for HARB in 2007.

3.3 Land Use and Socioeconomic Conditions

HARB Land Use

HARB occupies approximately 1,943 acres. 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 .

The Administrative and Industrial Support area and Airfield are comprised of 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 several major tenant commands. It includes aviation support

facilities (hangers 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 is open space and wetland, with some scattered forested areas. With the exception of the Hush House and Southeast Triangle areas, wetlands are the predominate land use features. These wetland areas, in part, are used for airfield drainage. The enclosed structures of the Hush House area are used for noise reduction for 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 contains the Munitions, Grenade Range and Reserves, Northeast Grassland, Southwest Clear Zone, and OU-2 areas). Collectively, these areas are largely unimproved and comprise the total area contained within the ESCZ arcs. Reserve bivouac training is conducted in the western boundary of the Grenade Range and Reserves area.

Regional Land Use

Land uses adjacent to HARB are principally agriculture, low- to medium-density residential and vacant land. To the east and south of HARB, land-use activity is primarily agriculture with some residential development. The majority of the agricultural land located near HARB is used for commercial plant nurseries. Beyond the agricultural land located east and south of HARB are large tracts of vacant land unprotected from development. Some agricultural land abuts HARB to the north, but the majority of land north of HARB is developed property associated with the former Homestead Air Force Base (AFB).

Most urban development occurs north and west of HARB and is within the Miami-Dade County urban development boundary (UDB). The UDB, as defined in the 2000 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 INRMP, Figure 3-7). The urban expansion area (UEA) as defined in the CDMP delineates the area where development may be warranted within the next 20 years. The UEA encompasses property immediately north of HARB (see INRMP, Figure 3-7). Although the extent of growth in south Miami-Dade County over the next 20 years is unclear, it can be surmised that the majority of growth will occur within the UDB and the UEA boundaries.

Socioeconomic Conditions

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.

The population of Homestead increased from 13,674 in 1970 to 20,668 1980; and to 26,694 in 1990. According to MyFlorida.com and the City of Homestead, there are 31,909 people in Homestead. However, a review of the U.S. Census data reveals that this number comes from the 2000 census. The U.S. Census estimates that the population grew to 56,601 in 2007, the most recent year in which an estimate is available. This is an increase of 56 percent.

Florida City is located approximately 5 miles southwest of HARB.. Over the last 30 years, the population of Florida City has experienced both growth and decline. Between 1980 and 1990 the city's population decreased 3.2% (2,804 people). Between 1990 and 2000, the population increased by 31.2% to 7,843 (SFRPC, 2000). The Florida City's population is expected to increase to 13, 278 by 2015 (USAF and FAA, 2000). A significant growth in residential and commercial land use has accompanied the more recent population growth, while little industrial growth has occurred.

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

3.4 Geological and Soil Resources

HARB is located within the Atlantic Coastal Ridge. 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 two million years ago (United States Department of Agriculture Natural Resources Conservation Service [USDA 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.

There are six different soil map units within HARB. INRMP Table 3-4 summarizes the important characteristics and the coverages of soil types on HARB (USDA NRCS, 1996). INRMP Figure 3-3 indicates the general location of the soil units on the Base. In general, approximately 74% of HARB land consists of Urban Land/Udorthents-Urban Land Complex soil types (see INRMP Table 3-4). 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 (USDA NRCS, 1996).

3.5 Water Resources

Water resources include surface water (canals, lakes and ponds, and a reservoir immediately off base), ground water, wetlands, and flood-prone areas. 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. Storm water runoff is collected in an internal drainage system of canals, swales, ditches, and pipes, most of which eventually discharge into the Boundary Canal System.

Boundary Canal System

The Boundary Canal system consists of the Boundary Canal, the Flightline Canal, several associated drainage canals/ditches, and the storm water reservoir. The Boundary Canal surrounds HARB property (Air Force Center for Environmental Excellence [AFCEE], 2001; see INRMP, Figure 3-5). 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 (see INRMP, Figure 3-5):

- The **west-south (W-S)** Boundary Canal segment begins in the northwestern corner of HARB at Biscayne Drive (SW 288th Street; HARS, no date). The segment flows along the west and south perimeters of the Base and leads to the storm water reservoir at its southeastern 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 Base. The N-E segment leads to the storm water reservoir at the southeast corner of the Base. The total length of the N-E segment is reported to be approximately 15,400 feet (2.9 miles; AFCEE, 2001).

Storm Water Reservoir

The storm water reservoir is located on the eastern side of the Base and receives flow from the W-S and N-E segments of the Boundary Canal system (see INRMP, Figure 3-5). The reservoir is approximately 300 feet wide and 900 feet long (AFCEE, 2001). Typical depths are estimated to range

between 10 to 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 located 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 normally open and provides passive flow between the canal and the reservoir, but is closed during pumping operations (AFCEE, 2001). 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 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).

Military Canal

Military Canal is located immediately east of the pump house and storm water reservoir (see INRMP, Figure 3-5). Military Canal is one in a series of canals that serve as a part of a complex water management system to control flooding, reduce salt water intrusion, maintain water flow into the Everglades, and provide recharge for municipal wellfields. The canal is approximately 11,400 feet long with an average width of 40 feet (AFCEE, 2001). A salt water control structure (S20G) is located 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 salt water 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, is 4,560 acre-feet (USAF and FAA, 2000). This represents about 1.1% of the total freshwater input to southern Biscayne Bay (USAF and FAA, 2000).

Lakes

Three lakes are within the 1,943-acre area, comprising approximately 30.2 acres or less than 2% of HARB. All the lakes on HARB are human-made, created from limestone borrow pits many decades ago. The 14.5-acre Phantom Lake is located along the western boundary of the Base, just north of the Munitions Storage area (see INRMP, Figure 3-5). A maintained unpaved road encircles the lake and provides access (HARB, 2003a). The Twin Lakes also referred to as the North and South Flight Line Lakes (7.7 and 8.0 acres, respectively) lie southeast of the runway (see INRMP, Figure 3-5). The northern of these two lakes has a surface water connection (via short culvert) to the Boundary Canal System (USAF and FAA, 2000).

Wetlands

During 2001, federal and state jurisdictional wetland surveys were conducted on HARB (HARB, 2003b). Of the nearly 1,943 acres within HARB, approximately 233.5 acres or 12% of the total land area have been identified as jurisdictional wetlands (see INRMP, Figure 3-5 and Volume II, Appendix D). All surveys were conducted in accordance with the United States Army Corps of Engineers (USACE) wetlands delineation manual (1987) and FDEP methods identified in Chapter 62-340, F.A.C. Additional details on the survey methods and results are provided in the *Wetlands Identification Report and Management Component Plan* in Volume II, Appendix D.

In general, types of wetlands occurring on the Base include wet marsh, wet prairie, or forested wetlands. 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% of wetlands are located within the infield of the taxiway and runway and appear to serve as drainage basins (HARB, 2003b). Specific locations of wetlands on HARB are illustrated in Volume II, Appendix D, on Figure D-3-2; Appendix D also contains the HARB wetlands rapid assessment procedure (WRAP) report that was conducted to assess the ecological quality of each identified wetland community based on its own attributes and characteristics. The WRAP is the state's methodology developed by the SFWMD and is used by the USACE for determining impacts to jurisdictional wetlands.

Flood-Prone Areas

Maps issued by the Federal Emergency Management Agency (FEMA) in 1996 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 INRMP, Figure 3-5; USAF and FAA, 2000). 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.

It is estimated that Category 1 and 2 hurricanes would not cause inundation of the Base, but a Category 3, 4, or 5 hurricanes 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 (AFRC, 2004).

3.6 Biological Resources

3.6.1 Threatened, Endangered and Protected Species

There is only one federally listed threatened or endangered plant or animal species known to occur regularly within the cantonment area of HARB. This is the American crocodile (*Crocodylus acutus*), which is occasional seen near the Twin Lakes area. On occasion, the federally listed wood stork (*Mycteria americana*) is seen in single or small groups (up to ten) on the Base, but there is marginal foraging potential on HARB and their occurrence is infrequent while nesting is not considered likely to occur.

State-Listed Wildlife Species

There are several state-listed animals known to occur on HARB, primarily bird species and the American alligator (*Alligator mississippiensis*). The alligator is listed as a species of special concern in Florida but federally listed as "threatened due to similarity of appearance" to the endangered American crocodile (*Crocodylus acutus*). While most of the bird life found on HARB are transient or migratory species associated with wetlands and other surface water bodies, the Florida burrowing owl (*Athene cunicularia floridana*) is established and can be found in several family groups in the grassy areas near the runway in the area of the control tower and other areas on base. All birds listed in Table 3-1 are also federally protected under the United States Migratory Bird Treaty Act.

Table 3-1

State-Listed Wildlife Species Recently Known to Occur on Homestead Air Reserve Base, Homestead, Florida

Common Name	State Status	Species Name
Birds		
Limpkin	SSC	*Aramus guarauna*
Little blue heron	SSC	*Egretta caerulea*
Reddish egret	SSC	*Egretta rufescens*
Snowy egret	SSC	*Egretta thula*
Tricolor heron	SSC	*Egretta tricolor*
White ibis	SSC	*Eudocimus albus*
Southeastern American kestrel	T	*Falco sparverius paulus*
Florida burrowing owl	SSC	*Athene cunicularia floridana*
Least tern	T	*Sterna antillarum*
Reptiles		
American alligator	SSC	*Alligator mississippiensis*

Key:
SSC = Species of Special Concern
T= Threatened

State-Listed Plant Species

State-listed plant species have been documented from a number of surveys conducted over the last ten years and are primarily found in the pine rockland habitat (see Table 3-2). Although bases are not required to provide similar conservation measures for species protected by state law as those required under the Endangered Species Act, protection measures should be adopted when not in conflict with the military mission.

Table 3-2
State-Listed Rare Plant Species Occurring or Known to Occur on Homestead Air Reserve Base, Homestead, Florida

Scientific Name **(common name)**	**State Status**	**Habitat Description**
Bletia purpurea (pinepink orchid)	T	Pine rocklands.
Byrsonima lucida (locust berry)	E	Native hardwood shrub, pine rocklands and hardwood hammocks.
Chamaesyce porteriana (Porter's spurge)	E	Areas of low vegetation density and exposed rock, esp. along road edges.
Coccothrinax argentata (silver palm)	E	Pine rocklands and hardwood hammocks.
Crossopetalum ilicifolium (quail or Christmas berry)	E	Pine rocklands, hardwood hammocks and edge of sinkholes.
Dichromena floridensis (white-top sedge)	R	Open areas with little or no shade.
Ernodea cokeri (one-nerved ernodea)	E	Pine rocklands.
Ilex krugiana (Krug's holly)	E	Pine rocklands, hardwood hammocks, and disturbed ground.
Ipomoea microdactyla (wild potato morning glory)	E	Pine rocklands and vacant lots.
Jacquemontia curtissii (pineland jacquemontia)	E	Shrubby edge of pine rocklands, spoil banks, vacant lots on limestone, and unmowed grassy areas.
Lantana depressa (Florida lantana)	E	Open, unmowed grassy areas, near shrubby thickets in pine rocklands.
Linum arenicola (sand flax)	E	Endemic to pine rocklands.
Linum carteri (Carter's small flowered flax)	E	Endemic to pine rocklands and also found on disturbed ground.
Melanthera parvifolia (melanthera)	E	Open, unmowed areas, pine rocklands, and on disturbed ground.
Poinsettia pinetorum (rockland painted-leaf)	E	Endemic to pine rocklands.
Pteris bahamensis (Bahama break)	E	Open areas near exposed limestone and solution holes in pine rocklands and sinkholes
Roystonea elata (royal palm)	E	Hardwood hammocks.
Sachsia polycephala (Bahama sachsia)	E	Endemic to pine rocklands on and near exposed limestone.
Sphenomeris clavata (wedgelet fern)	E	Endemic to pine rocklands on exposed limestone of shaded canal walls and solution holes.
Swietenia mahagoni (West Indian mahogany)	E	Hardwood hammocks.
Tetrazygia bicolor (Tetrazygia)	T	Hardwood shrub communities, pine rocklands, hardwood hammocks, and on disturbed ground.

Table 3-2 State-Listed Rare Plant Species Occurring or Known to Occur on Homestead Air Reserve Base, Homestead, Florida		
***Scientific Name* (common name)**	**State Status**	**Habitat Description**
Tragia saxicola (pineland noseburn)	E	Pine rocklands near limestone outcrops.

3.6.2 Vegetation

Historic Vegetative Communities

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.

The fresh water marsh ecological community is 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 (USDA NRCS, 1989). The type of marsh that most likely occurred on the Base is the marl prairie community, which occurs 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* sp.), white top sedge (*R. floridensis*), and muhly grass (*Muhlenbergia capillaries*). Fresh water 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], 1990).

Natural Communities

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. Areas of high quality natural communities on HARB have been identified in several previous surveys (e.g., Hilsenbeck, 1993; Argonne National Laboratory, 1997) and were also observed and described in 2001 as part of field reconnaissance and surveys. 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.

Results of the 2001 surveys conducted in these communities are further detailed in the *Fish and Wildlife/Threatened and Endangered Species Management Component Plan* in Volume II, Appendix F (HARB, 2003a). Refer to Figure 2-2 in the INRMP for the locations of the areas

described below and to Volume II, Appendix G, Table G-1, for a base-wide list of native and non-native plant species.

3.6.3 Fish and Wildlife and Habitat

HARB currently holds a USFWS Category 1 habitat classification 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 any management activities for the consumptive use of wildlife resources. Additional details are provided in the *Fish and Wildlife/Threatened and Endangered Species Management Component Plan* in Volume II, Appendix F (HARB, 2003a).

3.7 Cultural Resources

The National Park Service (NPS) conducted a survey of Homestead AFB in 1986 as part of an interagency technical assistance agreement between NPS and Homestead AFB (Air Combat Command [ACC], 1992). This survey included the entire former Homestead AFB to determine the need for and scope of any additional investigations necessary to discover significant cultural resources.

The report concluded that there was virtually no probability for the discovery of significant archaeological resources on the Base; the Florida State Historic Preservation Officer (SHPO) concurred with that conclusion. 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. In addition, a petition for waiver from the Integrated Cultural Resources Management Plan (ICRMP) Requirement was filed by the base civil engineer with AFRC-HQ in January 2007.

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 ineligible for the National Register of Historic Places (USAF and FAA, 2000).

3.8 Hazardous Materials and Waste

The operation of aircraft, vehicles, and equipment at HARB requires the use of various hazardous materials including fuels, solvents, lubricants, and caustics. The Base has several environmental programs that have been successful in controlling hazardous materials/waste releases to the environment. The Base Spill Plan and Hazardous materials (HAZMAT) Plan describes preventative actions that are designed to lower the potential for hazardous material spills and prevent them from entering the environment.

Another environmental program aimed at reducing hazardous waste is the Installation Restoration Program (IRP). The IRP at Homestead AFB (see Volume I, Section 2.4.2) was initiated in 1983 with a Phase I Record Search to identify potential areas of concern (AOCs) at the Base (AFCEE, 2001). In April 1993, a Resource Conservation and Recovery Act Facility Assessment were conducted to evaluate possible releases resulting from Hurricane Andrew. This assessment resulted in the identification of 68 solid waste management units or SWMUs (AFCEE, 2001). As of the end of 2006, there are 23 active IRP sites (see Volume I, Figure 3-4; 21 CERCLA sites and two petroleum sites) within the Base. Table 3-3 provides the site identifications, sites descriptions, regulatory document status, and current site status.

Table 3-5

Air Force Reserve Command (AFRC) IRP Site Status
Homestead Air Reserve Base, Homestead, Florida

Site	Site Description	Document	Current Site Status
OU-1	Fire Protection Training Area No.2	ROD (1995)	NFI/LUC (soil)
OU-2	Residual Pesticide Rinse Area	ROD (1996)	NFI/LUC (soil)
OU-3	PCB Spill Area	ROD (1994)	NFA
OU-4	Motorpool Oil Spill (Bldg. 312)	ROD (1995)	NFI/LUC (soil)
OU-5	Electroplating Waste Disposal Area	ROD (1997)	NFI/LUC (soil)
OU-7	Entomology Storage Area	ROD (1998)	GW LTM (annual)
OU-8	Fire Protection Training Area No.3	DD (1997)	NFI/LUC (soil)
OU-9	Boundary Canal	ROD (2003)	NFRAP
OU-10	Former Landfill	Closure Ltr. (1997)	NFRAP
OU-11(A)	Reservoir/Military Canal	ROD (2003)	Sediments LTM (annual)
OU-11(T)	Old Sewage Treatment Plant	ROD (2006)	GW LTM (annual)
OU-12	Entomology Shop (Bldg. 373)	ROD (2006)	NFI/LUC (soil)
OU-13	Hardfill Storage Area No. 3	DD (1997)	NFRAP
OU-15	Haz-Waste Storage (Bldg. 153)	ROD (2006)	GW LTM (annual)
OU-16	Hawk Missile Site/Waste Storage	Closure Ltr. (1997)	NFRAP
OU-17	C-130 Fuel Release (Bldg. 793)	Closure Ltr. (1997)	NFRAP
OU-18	Construction Debris Landfill	ROD (1998)	GW LTM (annual)
OU-19	AGE Shop (Bldg. 208)	Closure Ltr. (2001)	NFA
OU-25	Hush House Area	ROD (2006)	NFI/LUC (soil)
OU-27	Jet Engine Test Cell Facility	ROD (2006)	NFI/LUC (soil)
AOC-3	Munitions Storage Area	ROF (2000)	NFI/LUC (soil)
Petroleum Sites			
SS-02A	Bulk Storage Facility	N/A	GW LTM (annual)
SS-15C	Fuel Pipeline	N/A	GW LTM (annual)

Source: HARB, 2003b.
Key:

Site
OU = Operational Unit
AOC = Area of Concern
SS = State Site.

Status
DD = Decision Document.
IRA = Interim Remedial Action.
LTM = Long-Term Monitoring.
LUC = Land Use Controls.
MOP = Monitoring Only Plan.
NA = Natural Attenuation.
NFA = No Further Action.
NFI = No Further Investigation.

ROD = Record of Decision.
ROF = Record of Findings.

4 Environmental Consequences

This section of the EA assesses potential environmental consequences associated with the Proposed Action and No-Action alternatives. Potential impacts are discussed in the context of the scope of the Proposed Action described in Section 2.0 and the affected environment discussed in Section 3.0. Section 4.1 addresses the environmental consequences of the Proposed Action while the environmental consequences associated with the No-Action alternative are address in Section 4.2.

4.1 Proposed Action Environmental Consequences

4.1.1 Air Quality

Proposed Action (Implementation of Updated INRMP)

No effect would be expected. There would be no activities completed under the Proposed Action that would increase air emissions. Activity changes associated with the military mission (e.g., new equipment, increase personnel, construction or modification of existing facilities, or increase in military operations) are activities that may result in potential changes in air quality conditions. None of these activities are associated with the Proposed Action. Therefore, there would be no effects on air quality as a result of implementation of the Proposed Action.

4.1.2 Noise

Proposed Action (Implementation of Updated INRMP)

No effect would be expected. There would be no activities completed under the Proposed Action that would increase noise. Activity changes associated with the military mission (e.g., new equipment, increase personnel, construction or modification of existing facilities, or increase in military operations) are activities that may result in potential changes in the noise environment. None of these activities are associated with the Proposed Action. Therefore, there would be no effects on noise level or sound quality as a result of implementation of the Proposed Action.

4.1.3 Land Use and Socioeconomic Conditions

Proposed Action (Implementation of Updated INRMP)

Beneficial impacts would be expected to land use resources. The Proposed Action provides guidance on coordinating Base management efforts with land use management plans and programs with entities off base, (e.g., the South Florida Ecosystem Restoration Task Force, the South Dade Land Use and Water Management Plan, and the SFWMD) and provides procedures for integrating the management concept of the INRMP into all existing planning and management processes.

Achievement of INRMP objectives would minimize existing conflicts between military mission requirements and natural resources, and would ensure that new construction and training activities did not undermine ecological processes or interfere with natural restoration initiatives through the development of site selection and development guidelines.

No effect would be expected to socioeconomic resources. Public access to the Base would not be improved because of security reasons.

4.1.4 Geological and Soil Resources

Proposed Action (Implementation of Updated INRMP)

Beneficial impact would be expected. Implementation of the Proposed Action would continue existing HARB practices for effective soil erosion. Additional procedures in the areas of grounds maintenance and landscaping would be implemented that would supplement existing soil erosion procedures.

4.1.5 Surface Water

Proposed Action (Implementation of Updated INRMP)

Beneficial impacts would be expected. The Proposed Action recognizes programs, such as the IRP and Storm Water Pollution Prevention Program (SWPPP) in the protection of water quality. In addition, recommendations of the INRMP would contribute to the protection of water quality through updated instructions for grounds maintenance, removal of invasive and exotic species in canals and implementation of xeriscaping methods. In addition, the INRMP provides for water conservation and surface water improvement studies and the establishment of monitoring procedure for achieving wetland and water quality objectives.

A recommended feasibility study proposed in the INRMP for modification to infield wetlands to ensure the safety of the military mission may have a short-term adverse effect to wetland resources.

Potential wetland impacts would be offset by through improvement in surface water drainage, wetland mitigation, if necessary, and increased safety in conducting the military mission.

4.1.6 Biological Resources

Proposed Action (Implementation of Updated INRMP)

Threatened and Endangered Species. Beneficial impacts would be expected. Under the Proposed Action, restoration of the remnant pine rockland, a threatened community consisting of endemic south Florida species would occur. In addition, the INRMP provides for the overall enhancement, conservation, and protection of threatened and endangered plant and animal species within the limitations of the military mission. For example, enhanced protection of the state-listed burrowing owl would occur through increased coordination and communication between site managers and ground maintenance contractors, as well as educational efforts. Also, under the Proposed Action a Base-wide initiative for controlling invasive and exotic plant and animal species would be implemented.

Wildlife and Vegetation. Beneficial impact would be expected. Implementation of the Proposed Action would result in improved habitat conditions through the control of invasive and exotics plant and animal species.

4.1.7 Cultural Resources

Proposed Action (Implementation of Updated INRMP)

No effect would be expected. No impacts to cultural or archeological resources would be expected as a result of the Proposed Action.

4.1.8 Hazardous Materials and Waste

Proposed Action (Implementation of Updated INRMP)

No effect would be expected. Under the Proposed Action HARB would continue its existing IRP activities and all hazardous and toxic materials would continue to be handled in accordance with Federal laws and USAF regulations. There would be no increase in the generation of hazardous and toxic materials as a result of the Proposed Action. All existing programs to reduce the amount of hazardous materials and waste on the Base would continue.

4.2 No-Action Alternative

No adverse effect to natural resources would be expected. However, under the No-Action alternative, natural resource management at HARB would continue according to the earlier 2004 INRMP. Therefore, HARB would not be in compliance with the changes to the SAIA and other natural resources guidance that have occurred since then.

4.3 Cumulative Impacts

Cumulative impacts are the combined and/or incremental effects upon the environment that could potentially occur as a result of past, present, and reasonably foreseeable future actions, including the Proposed Action. The purpose of addressing cumulative impacts in the context of this EA is to address the incremental contribution of the Proposed Action to the effects of a broader range of factors.

The scenario for addressing cumulative impacts relevant to the Proposed Action includes two major factors: trends of increasing development and population growth in this region, and regional measures for the conservation and preservation of natural resources. Through the continued implementation of the INRMP, HARB would continue a comprehensive natural resource management strategy that represents compliance, restoration, prevention and conservation; improves the existing management approach; and meets legal and policy requirements consistent with broader natural resource management philosophies. In conjunction with this approach, HARB will engage in active partnering, information sharing, and participation with government and non-government stakeholders involved in natural resource management initiatives.

While growth and development can be expected to continue adjacent to HARB boundaries and within surrounding natural areas, cumulative adverse impacts to these natural resources would not be anticipated when considered with the effects of activities associated with the proposed management measures contained within the INRMP.

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Finding of No Significant Impact for Implementing an Integrated Natural Resources Management Plan for Homestead Air Reserve Base, Florida

AGENCY: United States Air Force Reserve Command (AFRC)

BACKGROUND: Pursuant to the Council on Environmental Quality (CEQ) Regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508) for implementing the procedural provisions of the National Environmental Policy Act (NEPA; 42 United States Code (U.S.C.] 4321 et seq.) and AFPD 3270, Environmental Quality, the United States Air Force (USAF) has conducted an Environmental Assessment (EA) of the potential affects associated with implementing an Integrated Natural Resources Management Plan (INRMP) at Homestead Air Reserve Base (HARB), Florida. The AFRC has prepared this Integrated Natural Resources Management Plan (INRMP) in accordance with the provisions of the Sikes Act Improvement Act of 1997 and AFI 32-7064, "*Integrated Natural Resources Management*".

PROPOSED ACTION: The USAF proposes to continue implementation of the INRMP in accordance with the Sikes Act Improvement Act (SAIA) and AFI 32-7064, which supports the management of natural resources as described by the plan itself. The purpose of the Proposed Action is to carry out the resource-specific management measures developed in the INRMP in accordance with the SAIA. Continued implementation of the INRMP would enable HARB to effectively manage the use and condition of natural resources located on the Base primarily to protect the natural setting for training purposes and would support the USAF's continuing need to ensure that the mission is conducted while practicing sound resource stewardship and complying with environmental policies and regulations.

The INRMP supports an ecosystem management approach and includes natural resource management measures to be undertaken on HARB, Homestead, Florida. The Proposed Action focuses on a 5-year planning period, which is consistent with the timeframe for the management measures described in the INRMP. This planning period began in 2009 and ends in 2013. Additional environmental analysis will be required as new management measures are developed for the next planning period and over the long-term (i.e., beyond the next 5 years).

ALTERNATIVES: The development of the proposed management practices for the INRMP included a detailed evaluation of alternative management scenarios. This analysis involved the review of accepted criteria, standards, guidelines, as well as laws and executive orders for natural resources management. Furthermore, the analysis included a comprehensive review of land areas on the Base, resources present, and each of the land areas role within the overall mission of the Base. Once the mission and resources for each land area was evaluated, various resource management scenarios were evaluated to determine the appropriate management measures for each land area. The outcome of the analysis led to the development of the Proposed Action as described above. Consistent with the intent of NEPA, this process focused on identifying a range of reasonable management alternatives and, from that, developed a plan that could be implemented, as a whole, to the foreseeable future. Management alternatives determined to be infeasible were not analyzed further. As a result of the process, the EA formally addresses two alternatives: the Proposed Action (i.e., implementation of the updated INRMP) and the No-Action alternative.

The continuation of existing (i.e., baseline) conditions of the affected environment, without implementation of the Proposed Action, is referred to as the no-action alternative. Inclusion of a no-

action alternative is prescribed by CEQ regulations and serves as benchmark against which the Proposed Action could be evaluated. Implementing the no-action alternative would mean that land management practices would remain the same and would continue without adherence to the post-2004 SAIA amendments and other related natural resources guidance. Current management measures for natural resources would remain in effect and existing conditions would continue. New natural resource management measures that address current conditions would not be implemented.

FACTORS CONSIDERED IN DETERMINING THAT NO ENVIRONMENTAL IMPACT STATEMENT IS REQUIRED: Analyses performed in the EA address potential effects of the Proposed Action and the no-action alternative on resources and areas of environmental concern that could be affected by the INRMP. These include land use, geological resources, water resources, biological resources, cultural resources, and socioeconomics. Implementation of the Proposed Action would result in beneficial effects on identified resources and areas of environmental concern.

FINDING OF NO SIGNIFICANT IMPACT (FONSI): Based on the results of the EA, it is determined that implementation of the Proposed Action would have no significant or adverse direct, indirect, or cumulative impacts on the quality of the natural or human environment. Implementation of the INRMP would be expected to improve existing conditions at HARB as shown by the potential for beneficial effects. The Proposed Action would enable HARB to achieve its goal of maintaining ecosystem viability, complying with environmental policies and regulations, and ensuring sustainability of desired military training conditions. Because there would be no significant environmental impacts resulting from implementation of the Proposed Action, an Environmental Impact Statement (EIS) is not required and will not be prepared.

The public and concerned organizations, including minority and low-income, disadvantaged, and Native American groups, will be notified of the findings and conclusions of this EA by an announcement of the availability of a FONSI in local newspapers and by the availability of the EA and the HARB INRMP for public review for 30 days. Copies of the FONSI, EA, and INRMP will be available for public review at the Homestead Branch of the Miami Dade County Library located at 700 N. Homestead Blvd. in Homestead, Florida..

Comments on the EA and this FONSI by any interested party may be submitted to the Public Affairs Office, 482 FW/PA, 29050 Coral Sea Boulevard, P.O. Box 46, Homestead ARB, Florida 33039-1299. The deadline for receipt of comments is 30 days after notice of availability is published.

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William B. Binger, Brigadier General, USAFR
Commander, 482nd Fighter Wing
Homestead Air Reserve Base, FL 33039-1299

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Date

I Wildland Fire Management Plan

Wildland Fire Management Plan
482nd Fighter Wing
Homestead ARB, FL

This Wildland Fire Management Plan (WFMP) is written IAW AFI 32-7064, Integrated Natural Resources Management, Chapter 12, Wildland Fire Management. 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 AF installations. The WFMP directly supports the AF mission and is consistent with installation emergency operations plans.

1. Goals and Objectives.

1.1 The highest goal and first priority of the Homestead Air Reserve Base (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.

1.2 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.

1.3 The third goal is to effectively use fire as a tool to manage fuel loads and habitat when resources and environmental conditions permit it.

2. Organizational Structure. The Chief, 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 IAW AFI 32-7064, Integrated Natural Resources Management, Chapter 12, Wildland Fire Management. The WFPM may delegate this authority of the position to one or more designees. The Wildland Fire Management organizational structure fits within the installation command structure in the same place as the rest of Fire and Emergency Services. The organizational structure for wildland fire activities will be consistent with National Wildfire Coordinating Group (NWCG) Incident Command System standards. The HARB Natural Resources Manager in conjunction with the BASH program will develop goals to be achieved by the use of prescribed fire, if it is determined to be in the best interest of the base, and only after a prescribed burn plan is developed and approved.

3. Interagency Cooperation and Mutual Aid Agreements. HARB has developed or is in the process of 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.* Interagency agreements and mutual assistance agreements are included in this WFMP as references or appendices. (NOTE: Copies of these agreements will be included in the post-AUG 2009 version of this plan).

4. Smoke Management and Air Quality. This paragraph describes the mission, environmental, human health and safety factors specific to the installation and region that affect smoke management and identifies necessary mitigation practices. It should be noted that throughout most of the year, the prevailing wind over former Homestead Air Force Base (HAFB) and the cantonment area of HARB is primarily out of the east, which would result in smoke being blown towards nearby residential areas towards the west.

4.1 Mission factors at HARB are primarily the management of fire to protect airfield equipment, and management of smoke to minimize adverse impacts on the flying mission and to nearby local residential and agricultural areas, and the two nearby national parks (Everglades and Biscayne).

4.2. Because of its unique subtropical location in South Florida, HARB, and some other portions of former HAFB, are home to a number of dense stands of invasive non-native plant species (including trees, shrubs, and tall grasses) with high potential fuel loads. In many cases, the vegetative growth has resulted in the development of dense monoculture stands with thick deposits of duff/pine needles (e.g., Australian pines) or culms (Burma reed).

4.3. Human Health. HARB is within an attainment area for air quality.

4.4. Safety concerns involve the potential risk of harm to firefighters, to property on and off the base, to flying and grounded aircraft, and to vehicles. The flat topography, some types of wildland fuels, base roadways, and extensive airfield pavements, and jurisdictional wetlands within HARB, to some extent, decrease risk in some areas of the base to people and property from wildland fire. However, in other areas both on base (especially along the base perimeter), and within former HAFB parcels, there is the presence of potential for high fuel loads, which combined with poor road accessibility, would greatly impact fire fighting activities. Maps A and B show potential fire risk areas both on and off the base, respectively. Firefighters will coordinate their efforts with Homestead Operations Group, Ground Control, and Airfield Management to minimize or eliminate any smoke impacts on aircraft maintenance and operations. They will manage smoke so that is does not lower visibility on roads or the nearby Florida Turnpike.

4.5 Mitigation. The WFPM will mitigate, in advance to the extent practical, adverse impacts of wildland fire through sound management of suppression and public affairs resources.

4.6 Adaptive Management. Unintended wildfires pose an adaptive management opportunity to achieve natural resources and base security objectives. The WFPM may, with the input of command and the Natural Resources Manager, and if weather conditions warrant it, exercise discretion not to immediately extinguish these fires. The WFPM will ensure that timely notice is given to regulators, the media and neighbors in that case.

5. Safety and Emergency Operations. **Firefighter and public safety is the first priority in every wildland fire management activity.** The WFMP will ensure that installation-specific safety and emergency operations protocols are identified to mutual aid crews and in prescribed

burning plans. NFPA 1977 – *Standard on Protective Clothing and Equipment for Wildland Fire Fighting* establishes the requirements for protective clothing.

6. Risk Assessment/Decision Analysis Processes. Sound operational risk management is the foundation of this Wildland Fire Management Plan. The WFPM will use the United States Forestry Service (USFS) Wildland Fire Assessment System (WFAS), which can be found at the website http://www.wfas.net/content/view/17/32/ to assess wildfire risk and potential fire behavior. WFAS adequately describes fire hazard, severity, intensity, and other significant factors affecting the protection of life and property. The environmental factors to be measured prior to the occurrence of a wildland fire may evolve with advances in wildland fire science and the availability of information. Some examples of factors are: fuel model, mid-flame wind speed (mph) wind direction required, 20-foot wind speed (mph), mixing height/transport winds or dispersion index, relative humidity, fine (1 hour) fuel moisture, 10 hour time lag, temperature, rate of spread (chains per hour), flame lengths (feet), long-term drought indicators, and probability of ignition. Local prevailing weather patterns that would affect fire behavior on the installation are rapid change in wind directions and intensity from approaching storm cells, passing of winter-time (i.e., dry season) frontal systems, extended dry seasons, and passing summer-time thunder storms.

7. Wildland Fire History. Homestead ARB is susceptible to wildland fire events both within and close to the base that could stop or delay the Wing's flying mission due to heavy smoke over the runway. There have been several small wildland fires within the HARB cantonment area and within former HAFB property between 2001 and 2009, none major. Although great amounts of fuel loads are present in a number of areas on, adjacent, or near HARB, the base has been fortunate that no significant wildfires have occurred within the above time frame. However, in the mid-90s during the BRAC transition period, a major fire caused by a lightning strike did occur during the dry season within a poorly accessible, heavily overgrown, non-developed area within the western portion of the HARB cantonment area killing a large number of of non-native trees and shrubs. Overall, past on and off base wildland fires have included fires in weeds, grass, brush, and forested areas. In 2004 HARB attempted an experimental prescribed fire action within a dense monoculture stand of tall non-native trees (Australian pines) just south of the runway. The prescribed burn activities were performed by qualified crews (i.e., for logging and burning) from the United States Department of Agriculture (USDA). The primary purposes of their effort was to resolve a significant BASH issue (i.e., to remove a major attractant for large wading and raptor birds to roost so close to the runway) and to allow proper conformance with airfield height obstruction criteria.

Actual wildfires within former HAFB have been very infrequent and relatively small due to quick response 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 far west of the base. More recently the number of homes built in areas to the west that once had wildland fire potential is increasing. Human populations will continue to increase in the wildland/urban interface, which is particularly important in that a major percentage of wildland fires in South Florida have been demonstrated to be human-caused, by either accidental or deliberate means.

Wildland fires have characteristics of their own that are not comparable to others forms of fire fighting, such as for structures or aircraft. Local topography, fuel load type, water availability, and weather conditions present different challenges. Once a wildland fires starts, burning is generally rapid and continuous, and often very intense. There are many factors that can affect wildland fire behavior, but the three most important factors 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 unexpected wind gusts, can fan the flames of a wildand fire into greater intensity and supply additional fresh air that would speed combustion to the point where very large fires create their own winds. In addition, the presence of old man-made surface drainage features, especially narrow deep ditches, would inhibit accessibility in fighting some fires at crucial periods.

8. Natural and Cultural Resources Considerations. The sensitive natural resources that should be given consideration before conducting any wildland fire management activity on HARB are the presence on base of jurisdictional wetlands and several federal and state-listed species of concern (e.g., potential American crocodile and burrowing owl breeding spots).

It should be noted that there are no sensitive cultural or historical resources, structures, or features present on base that need to be given consideration before conducting any wildland fire management activity.

9. Mission Impact Considerations. The potential positive impacts to the installation mission that may occur as a result of implementation of the WFMP are lowering the risk of intense, unplanned wildfires and removing non-native invasive species stands (e.g., Australian pine stands) that may attract flocks of birds or act as bird rookeries and pose a definite BASH risk. Potential negative impacts to the installation mission are reduced flying by training or transient aircraft when prior permission is required to operate at or on HARB's airfield. Past experience elsewhere has shown the potential impact to be very limited during prescribed burning activities.

10. Monitoring Requirements. There are several environmental factors that should be monitored after the occurrence of a wildfire. For HARB, some of these factors are given below. The percent duff/thatch, grass culm, and vegetative removal as caused by the fire will be monitored immediately after the fire takes place. Qualitative census of post-fire vegetative re-growth and animal usage will be observed and recorded. Areas that might require select herbicide application, by base grounds maintenance personnel, will be defined to assist in curbing subsequent re-growth of unwanted non-native species and/or bird attractant areas/conditions.

11. Public Relations. A protocol will need to be developed for notifying the media and affected persons for wildfire incidents. 482 FW/PAO (Public Affairs Office) and the Installation Commander will decide when and how to advise the media and affected persons of wildfire incidents. The PAO will coordinate with the WFPM to ensure the media and affected persons are notified of the after effects of any occurrence of substantial uncontrolled fires.

12. Funding Requirements. The Natural Resources Manager in conjunction with the WFPM will identify and budget through projects in ACES PM for funding requirements to hire or train and

equip wildland fire management personnel to ensure safe, effective, and cost-efficient operations in support of the WFMP. (NOTE: More detailed information re how the funding requirements are to be handled will be included in the post-AUG 2009 version of this plan).

12.1. Wildland fire management activities that are conducted for the purpose of compliance with environmental laws and regulations will be supported by conservation funds.

12.2. Wildfire suppression, and/or other wildland fire management activities to support training, range use, munitions testing and evaluation, or other mission activity will be supported by the responsible activity through direct funding or reimbursement.

12.3. Funding for wildfire prevention and fuels management for hazard reduction is an installation operations and maintenance responsibility.

13. Personnel Training and Certification Standards and Records. The WFMP will identify the staffing requirements, according to specific certification and training requirements, for the tasks associated with wildland fire management activities on the installation. Current training and qualification records will be maintained for all personnel involved in wildland fire management activities.

14. Environmental Impact Analysis Process for WFMP Implementation. Based on projects performed on other USAF installations in Florida and elsewhere, the actions proposed in this WFMP do not constitute a major federal action as defined in 40 CFR Part 1508.18 (b) (2).

Approved.

//SIGNED//

WILLIAM B. BINGER, Brig Gen, USAFR XX XX 2009
Commander Date