FINAL

NAVAL SUPPORT ACTIVITY ORLANDO,

LEFAC/BUGG SPRING FACILITY,

LAKE COUNTY, FLORIDA

INTEGRATED NATURAL RESOURCES

MANAGEMENT PLAN

February 2016

NAVAL SUPPORT ACTIVITY (NSA) ORLANDO,
LEFAC/BUGG SPRING FACILITY, LAKE COUNTY, FLORIDA
INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
2016 OPERATION AND EFFECT CONCURRENCE

This Integrated Natural Resource Management Plan (INRMP) provides for natural resources management of the Navy Tactical Towed Array Calibration Facility at Leesburg (LEFAC) in Lake County, Florida, also referred to as the Bugg Spring facility. The Sikes Act and Department of Defense require that annual and 5-year operation and effect reviews of INRMPs occur with the U.S. Fish and Wildlife Service (USFWS) and the state fish and wildlife agency. Representatives of the Navy, USFWS, and the Florida Fish and Wildlife Conservation Commission participate annually in the Bugg Spring facility INRMP and Natural Resources Metric review. By signing below, the USFWS and the Florida Fish and Wildlife Conservation Commission concur that the management actions prescribed in the INRMP will contribute to the conservation and rehabilitation of installation natural resources.

Approving Officials:

Commanding Officer **Naval Support Activity Orlando**	**(Date)**
Natural Resources Manager **Naval Support Activity Orlando**	**(Date)**
U.S. Navy Regional Environmental Coordinator	**(Date)**
Natural Resource Manager **Commander Navy Region Southeast**	**(Date)**
U.S. Fish and Wildlife Service	**(Date)**
Florida Fish and Wildlife Conservation Commission	**(Date)**

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EXECUTIVE SUMMARY

ES.1 Type of Document

This is an Integrated Natural Resources Management Plan (INRMP).

ES.2 Purpose of Document

The purpose of this document is to meet statutory requirements under the Sikes Act Improvement Act (SAIA), Public Law (PL) 105-85, Div. B. Title XXIX, Nov. 18, 1997, 111 Stat 2017-2019, 2020-2022. 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 installations. To facilitate this program, the amendments require the Secretaries of the military departments to prepare and implement INRMPs for each military installation in the United States (U.S.) unless the absence of significant natural resources on a particular installation makes preparation of a plan for the installation inappropriate. Naval Facilities Engineering Command (NAVFAC) Southeast has prepared this INRMP for U.S. Department of the Navy (Navy) for the management of the Tactical Towed Array Calibration Facility at Leesburg (LEFAC), also referred to as Bugg Spring, Lake County, Florida.

The INRMP is a long-term planning document to guide the installation commander in the management of natural resources to support the installation's mission, while protecting and enhancing installation resources for multiple use, sustainable yield, and biological integrity. The primary purpose of the INRMP is to ensure that natural resources conservation measures and military operations on the installation are integrated and consistent with stewardship and legal requirements. This INRMP covers a 5-year period, but is reviewed annually, and has the flexibility to accommodate changes in the ecosystem or natural resources management supporting the military mission.

ES.3 Goals and Objectives of the INRMP

The development and implementation of the INRMP is a dynamic, multidisciplinary planning process that incorporates as its primary goal the support and maintenance of the military mission while managing, protecting, and enhancing the biological integrity of military lands and water resources. Furthermore, the INRMP creates an ecosystem-based conservation program that provides for conservation and rehabilitation of natural resources in a manner that is consistent with the military mission; integrates and coordinates all natural resources management activities; provides for sustainable multipurpose uses of natural resources; and provides military personnel with access to natural resources subject to safety and military security considerations. The

overall management objectives are to integrate land management, forest management, and fish and wildlife management as practicable and consistent with the military mission and established land uses. Specific management goals and objectives identified in this INRMP include the following:

- Ensure compliance of installation actions with Federal, state, and local laws, and U.S. Department of Defense (DoD) policy and instruction.
- Achieve no net loss of wetlands and floodplains and maintain wetland function and habitat quality.
- Facilitate regular measurements of spring water quality and quantity to continue existing monitoring efforts.
- Maintain water quality standards commensurate with levels adopted by Florida Department of Environmental Protection and the state Wildlife Action Plan.
- Prevent water flowing off roadways and roofs from becoming channelized, and stabilize and repair erosive flowpaths.
- Minimize use of pesticides and fertilizers on the LEFAC/Bugg Spring facility.
- Maintain and encourage forb growth to benefit gopher tortoise (*Gopherus polyphemus*) on the LEFAC/Bugg Spring facility.
- Maintain water quality by reducing rutting and potholes on Bugg Spring Road.
- Manage land resources to avoid activities that would reduce floodplain capacity or increase flooding rates.
- Monitor invasive species to inform control regimens that minimize their introduction and spread, and cooperate with regional invasive species management efforts.
- Maintain and/or enhance existing forest.
- Build interagency relationships with stakeholders to manage fish and wildlife resources and their habitats.
- Protect and manage for rare, threatened, and endangered (RTE) species.
- Schedule appropriate surveys for RTE species found at the LEFAC/Bugg Spring facility at regular scheduled intervals.
- Avoid introduction of invasive aquatic species.

ES.4 Species Management

Management actions described in this INRMP are for the benefit of the plants, animals, and ecosystems occurring on the LEFAC/Bugg Spring facility. Special attention is given to RTE species and their habitats through management actions and projects referenced in Table ES-1. Monitoring RTE species (Project 2 in Table ES-1) allows natural resources managers to identify which RTE species occur on the installation and where their habitats are located so that negative impacts can be avoided. Projects to address those RTE species can then be developed, such as vegetation management (Project 4 in Table ES-1) to help ensure establishment of native plant communities that will benefit gopher tortoises.

Table ES-1. Anticipated Projects to Be Implemented during Fiscal Years 2014 through 2023 in Support of the INRMP

Fiscal Year(s)	Project No.	Management Action	Project	Program Element Support	INRMP Section
2014-2023	1	Invasive Plant Species Control	Invasive Plant Treatment and Removal	Invasive Species Management	4.1.5
2018, 2023	2	Biological Monitoring*	Rare, Threatened, Endangered and Protected Species Surveys	ESA Compliance	4.3.2
2018, 2023	3	Migratory Bird Surveys*	Bird Surveys	ESA and MBTA Compliance	4.3.3
2016-2023	4	Vegetation Management	Revegetate Citrus Orchard	ESA Compliance, Invasive Species Management	4.1.4
2016-2023	5	Aquatic Species Management	Control Invasive Fish Species	Invasive Species Management	4.3.4
2014-2023	6	Update INRMP	Annual INRMP Review and Update	Sikes Act Compliance	4.6

* Ongoing Project Endangered Species Act (ESA) Migratory Bird Treaty Act (MBTA)

The section "Rare, Threatened, and Endangered Species" (Section 4.3.2) in this INRMP includes goals and objectives, projects, management strategies, and natural history information for RTE species found or that potentially occur on the LEFAC/Bugg Spring facility. Animal and plant species explicitly accounted for in this INRMP include the following:

- American alligator
- American eel
- Bluenose shiner (fish)
- Britton's beargrass (plant)
- Carter's warea (plant)
- Celestial lily (plant)
- Chapman's sedge (plant)
- Craighead's noddingcaps (plant)
- Eastern diamondback rattlesnake
- Eastern indigo snake
- Giant orchid (plant)
- Gopher frog
- Gopher tortoise
- Florida mountainmint (plant)
- Florida mouse
- Florida pygmy-pipes (plant)
- Florida sandhill crane (birds)
- Florida scrub-jay (bird)
- Florida willow (plant)
- Incised agrimony (plant)
- Lake Eustis pupfish
- Lewton's polygala (plant)
- Limpkin (bird)
- Manyflower grasspink (plant)
- Monarch butterfly
- Nodding pinweed (plant)
- Okeechobee gourd(plant)
- Papery whitlow-wort (plant)
- Piedmont jointgrass (plant)
- Pigeon wings (plant)
- Pineland butterfly pea (plant)
- Pinkroot (plant)
- Pygmy fringetree (plant)
- Sand skink (reptile)
- Scrub buckwheat (plant)
- Scrub plum (plant)
- Short-tailed snake
- Sherman's fox squirrel
- Southern hog-nosed snake
- Spotted turtle
- Variable leaf Indian plantain (plant)
- Wood stork (bird)

ES.5 Projects of the INRMP

Projects are discrete actions for fulfilling a particular goal or objective. Projects may be required in order for the LEFAC/Bugg Spring facility to fulfill regulatory requirements regarding natural resources management, enhance existing measures for ensuring compliance, or support or sustain military training. Projects currently planned or funded are shown in Table ES-1 and address vegetation management, invasive plant species control, RTE species surveys, aquatic species management, migratory bird surveys, and annual INRMP updates.

Funding for implementation of the INRMP will come from the Commander, Naval Installations Command, or NAVFAC natural resources fund sources. The natural resource program described in this INRMP is divided into mandatory and stewardship categories to reflect implementation priorities (Table ES-2). Every effort will be made to acquire environmental operations and maintenance (O&M[N]) or other funding to implement DoD mandatory projects, in the timeliest manner possible. Projects in the stewardship category will be funded through forestry, agricultural outlease, fish and wildlife, Legacy, or other fund sources as funding and personnel resources become available.

Table ES-2. Anticipated Projects for Fiscal Years 2014 through 2023

Project No.	Project Description	Mandatory (M) or Stewardship (S)	Recurring
1	Invasive Plant Removal	M	Annually
2	RTE and Protected Species Surveys	M	Non-annually
3	Bird Surveys	M	Non-annually
4	Revegetate Citrus Orchard	S	Non-annually
5	Control Invasive Fish	S	Non-annually
6	INRMP Update	M	Annually

* A contract is under way to conduct RTE and species surveys as well as bird surveys in 2013.
Note: Project costs and execution are dependent on natural resources management priorities and amounts are subject to available funding allocations.

ES.6 Physical Environment and Ecosystems

The LEFAC/Bugg Spring facility is located in Lake County, Florida, and occupies approximately 78 acres. The Navy has plans to purchase approximately 7 additional acres of neighboring property. The most notable physical feature on the LEFAC/Bugg Spring facility is Bugg Spring, which is a conduit through rock that fills a sinkhole creating a lake that is approximately 174 feet deep and 400 feet across. This sinkhole lake formed by Bugg Spring provides unique conditions for calibration of sonar and tactical towed array equipment because it is thermally stable, has consistent and non-turbulent flow, and provides an extremely low noise environment. In addition to the aquatic habitat of the spring and sinkhole lake, there is a small spring-run stream that drains the lake and associated forested wetlands. The site also contains a forested upland,

manicured lawn, abandoned agricultural field, and cleared meadow. The LEFAC/Bugg Spring facility also contains an office building and a storage building used by LEFAC/Bugg Spring personnel, and three houses and three barns that the previous landowners continue to occupy. There is a floating platform on the Bugg Spring lake that contains a workshop, booms, rigging, and other structures used to support testing equipment.

The topography of the LEFAC/Bugg Spring facility is relatively flat, with slightly higher elevations on the southern and western portions of the facility that slope down toward the northeast. The sinkhole lake sits in a bowl-shaped depression in the center of the facility and drains via a spring-run stream towards the northeast. Neighboring properties include agricultural fields, rural residences, a community of manufactured homes, a wastewater reclamation facility, and an expanse of wetlands, marsh, and open water.

RTE species are known to occur on the LEFAC/Bugg Spring facility, as are wetlands and waters of the U.S. regulated by the U.S. Army Corps of Engineers under Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act. In the event that physical and/or natural resources are impacted by Navy actions, the Navy would coordinate with the applicable regulatory agency to fulfill regulatory requirements.

ES.7 Mission Sustainability

The goal at the LEFAC/Bugg Spring facility is to provide a venue and support for calibration of sonar and tactical towed array equipment while conserving the area's natural resources. Implementation of the INRMP by Naval Support Activity (NSA) Orlando will primarily focus on enhancing and sustaining the military mission, but at the same time will implement projects designed to enhance and protect the natural resources on the LEFAC/Bugg Spring facility. During the development of this INRMP, RTE species surveys were performed. Survey efforts also addressed the presence/absence of invasive species and produced habitat characterizations and a wetland assessment. This information was used in developing management recommendations to enhance the native environment while promoting mission objectives. Table ES-3 provides a crosswalk list comparing the INRMP outline template provided by DoD with the outline of this INRMP.

Table ES-3. Crosswalk Table to U.S. Department of Defense INRMP Template

Recommended INRMP Structure from DoD Template Provided in Navy Guidance	Cross-Reference to LEFAC/Bugg Spring INRMP Structure
Title Page	Title Page
Signature Page	Signature Page
Executive Summary	Executive Summary
Table of Contents	Table of Contents
Chapter 1 – Overview	Chapter 1.0 – Overview
a. Purpose	1.1 Purpose of Plan
b. Scope	1.2 Scope
c. Goals and Objectives	1.3 Goals and Objectives
d. Responsibilities	1.4 Responsibilities
1. Installation Stakeholders	1.4 Responsibilities
2. External Stakeholders	1.4 Responsibilities
e. Authority	1.5 Authority
f. Stewardship and Compliance	1.6 Stewardship and Compliance
g. Review and Revision Process	1.7 Review and Revision Process
h. Management Strategy	1.8 Management Strategy
i. Other Plan Integration	1.9 Other plan integration
Chapter 2 – Current Conditions and Use	Chapter 2.0 – Current Conditions and Use
a. Installation Information	2.1 Installation Information
1. General Description	2.1.1 General Description
2. Regional Land Uses	2.1.5 Regional Land Uses
3. Abbreviated History and Pre-military Land Use	2.1.4 Abbreviated History and Pre-military Land Use
4. Military Mission	2.1.2 Military Mission
5. Operations and Activities	2.1.3 Operation and Activities
6. Constraints Map	2.1.6 Constraints Map
7. Opportunities Map	2.1.7 Opportunities Map
b. General Physical Environment and Ecosystems	2.2 General Physical Environment and Ecosystems
c. General Biotic Environment	2.3 Biotic Environment
1. T&E Species and Species of Concern	2.3.7 Rare, Threatened, and Endangered Species
2. Wetlands and Deep Water Habitats	2.3.8 Waters of the U.S. and Wetlands
3. Fauna	2.3.9 Fauna
4. Flora	2.3.1 to 2.3.6 (Flora by Habitat Type)
Chapter 3 – Environmental Management Strategy and Mission Sustainability	Chapter 3.0 – Environmental Management Strategy and Mission Sustainability
a. Supporting Sustainability of the Military Mission and the Natural Environment	3.1 Supporting Sustainability of the Military Mission and the Natural Environment
1. Integrate Military Mission and Sustainable Land Use	3.1.1 Military Mission and Sustainable Land Use
2. Define Impact on the Military Mission	3.1.2 Defining Impact on the Military Mission
3. Describe Relationship to Range Complex Management Plan or other Operational Area Plans	3.1.1 Military Mission and Sustainable Land Use

Table ES-3, continued

Recommended INRMP Structure from DoD Template Provided in Navy Guidance	Cross-Reference to LEFAC/Bugg Spring INRMP Structure
b. Natural Resources Consultation Requirements	3.2 Natural Resources Consultation Requirements
c. NEPA Compliance	3.3 Planning for NEPA Compliance
d. Beneficial Partnerships and Collaborative Resource Planning	3.4 Beneficial Partnerships and Collaborative Resource Planning
e. Public Access and Outreach	3.5 Public Access and Outreach
1. Public Access and Outdoor Recreation	3.5.1 Public Access
2. Public Outreach	3.5.2 Public Outreach
f. Encroachment Partnering	3.6 Encroachment Partnering
g. State Comprehensive Wildlife Plans	3.7 State Comprehensive Wildlife Plans
Chapter 4 – Program Elements	Chapter 4.0 – Program Elements
a. Threatened and Endangered Species Management, Critical Habitat, Species of Concern Management	4.3.2 Rare, Threatened, and Endangered Species
b. Wetlands and Deepwater Habitats Management	4.1.1 Watershed Management and Wetlands
c. Law Enforcement of Natural Resources Laws and Regulations	4.4 Conservation Law Enforcement
d. Fish and Wildlife Management	4.3 Fish and Wildlife Management
e. Forestry Management	4.2 Forest Management
f. Vegetative Management	4.1.4 Vegetation Management
g. Migratory Birds Management	4.3.3 Migratory Birds
h. Invasive Species Management	4.1.5 Invasive Plant Species Management
i. Pest Management	Not Applicable
j. Land Management	4.1 Land Management
k. Agricultural Outleasing	Not Applicable
l. Geographical Information Systems Management, Data Integration, Access, Reporting	4.5.2 Geographic Information Systems, Data Integration, Access, Reporting
m. Outdoor Recreation	Not Applicable
n. Bird Aircraft Strike Hazard	Not Applicable
o. Wildland Fire Management	4.2.2 Wildland Fire Management
p. Training of Natural Resource Personnel	4.5 Training of Natural Resource Personnel
q. Coastal/Marine Management	Not Applicable
r. Floodplains Management	4.1.3 Floodplain Management
s. Other Leases	Not Applicable
Chapter 5 – Implementation	Chapter 5.0 – Implementation
a. Summary of Project Description Development Process	5.1 Plan Implementation and Review
b. Achieving No Net Loss	5.2 Planning and Mission Sustainability
c. Use of Cooperative Agreements	5.3 Partnerships
d. Funding	5.4 Funding
Appendix 1- List of Acronyms	Follows Table of Contents
Appendix 2- Detailed Natural Resources Management Prescriptions	2.2 Biotic Environment
Appendix 3- List of Projects	Table 5-1

Table ES-3, continued

Recommended INRMP Structure from DoD Template Provided in Navy Guidance	Cross-Reference to LEFAC/Bugg Spring INRMP Structure
Appendix 4- Survey Results	Appendix B– Species Detected at the LEFAC/Bugg Spring facility
Appendix 5- Research Rquirements	Not Applicable
Appendix 6- Migratory Bird Management	4.3.3 Migratory birds and Appendix B– Species Detected at the LEFAC/Bugg Spring facility
Appendix 7- Benefits for Endangered Species	4.3.2 Rare, Threatened, and Endangered Species
Appendix 8- Critical Habitat Issues	2.3.7.2 Critical Habitat

Source: Office of Under Secretary of Defense (2006)

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ABBREVIATIONS AND ACRONYMS

Action Plan	Upper Ocklawaha Basin Management Action Plan
BMP	Best Management Practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	Cubic Feet Per Second
CNO	Chief of Naval Operations
CNRSE	Commander, Navy Region Southeast
CO	Commanding Officer
DoD	Department of Defense
DoDINST	Department of Defense Instruction
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ERP	Environmental Resource Permit
ESA	Endangered Species Act
ft^3/s	Cubic Feet Per Second
^oF	Degrees Fahrenheit
FDEP	Florida Department of Environmental Protection
FEMA	Federal Emergency Management Agency
FNAI	Florida Natural Areas Inventory
FWC	Florida Fish and Wildlife Conservation Commission
GIS	Geographic Information System
INRMP	Integrated Natural Resource Management Plan
LEFAC	Tactical Towed Array Calibration Facility at Leesburg
MBTA	Migratory Bird Treaty Act
MOU	Memorandum of Understanding
NAVFAC	Naval Facilities Engineering Command
NAVSEA	Naval Sea Systems Command
NEPA	National Environmental Policy Act
NGOs	Non-Governmental Organizations
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	Naval Support Activity
NUWC	Naval Undersea Warfare Center
O&M(N)	Operations and Maintenance
OPNAVINST	Chief of Naval Operations Instruction
OUSD	Office of Under Secretary of Defense
PL	Public Law
RTE	Rare, Threatened, and Endangered
SAIA	Sikes Act Improvement Act
SJRWMD	St. Johns River Water Management District
U.S.	United States
USACE	U.S. Army Corps of Engineers
U.S.C.	U.S. Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Survey
USRD	Underwater Sound Reference Division

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1.0 OVERVIEW

1.1 PURPOSE OF PLAN

The purpose of this Integrated Natural Resources Management Plan (INRMP) is to meet statutory requirements under the Sikes Act Improvement Act (SAIA), PL 105-85, Div. B. Title XXIX, November 18, 1997, 111 Stat 2017-2019, 2020-2022. The Sikes Act, 16 United States Code (U.S.C.) § 670a et seq., was amended in November 1997 to require the Secretary of Defense to carry out a program to provide for the conservation and rehabilitation of natural resources on military installations. To facilitate this program, the amendments require the preparation and implementation of INRMPs for each military installation in the United States (U.S.) unless the absence of significant natural resources on the installation makes preparation of a plan inappropriate. These plans are reviewed annually with the state wildlife agency and U.S. Fish and Wildlife Service (USFWS) and modified as necessary. The INRMP is a long-term planning document to guide the installation commander in the management of natural resources to support the installation mission, while protecting and enhancing installation resources for multiple uses, sustainable yield, and biological integrity. The primary purpose of the INRMP is to ensure that natural resources conservation measures and military operations on the installation are integrated and consistent with U.S. Department of the Navy (Navy) policy and legal requirements.

The INRMP will be reviewed by USFWS and the Florida Fish and Wildlife Conservation Commission (FWC) to gain mutual agreement on the fish and wildlife management aspects of the plan. The INRMP will also be made available for public review.

Naval Facilities Engineering Command (NAVFAC) Southeast is preparing this INRMP for the Navy Tactical Towed Array Calibration Facility at Leesburg (LEFAC), also referred to as Bugg Spring, Lake County, Florida, to comply with the SAIA and with Department of Defense (DoD) Instruction (DoDINST) 4715.3 (Figure 1-1). This INRMP also complies with the Office of the Chief of Naval Operations Instruction (OPNAVINST) 5090.1C, Chapter 22, Assistant Secretary of the Navy (Installations and Environment) Memorandum of 12 August 1998, Office of the Under Secretary of Defense (OUSD) Memorandum of 21 September 1998, Chief of Naval Research letter Ser N45D/8U589016 of 25 September 1998, Chief of Naval Operations (CNO) letter Ser N456F/8U589129 of 30 November 1998, and OUSD Memorandum of 14 August 2006.

Section 1 provides a general overview of the purpose and intent of the INRMP, its scope, goals, objectives, and implementation, procedures for reviewing and amending the INRMP, and a description of the overall management strategy. Section 2 describes the current conditions and

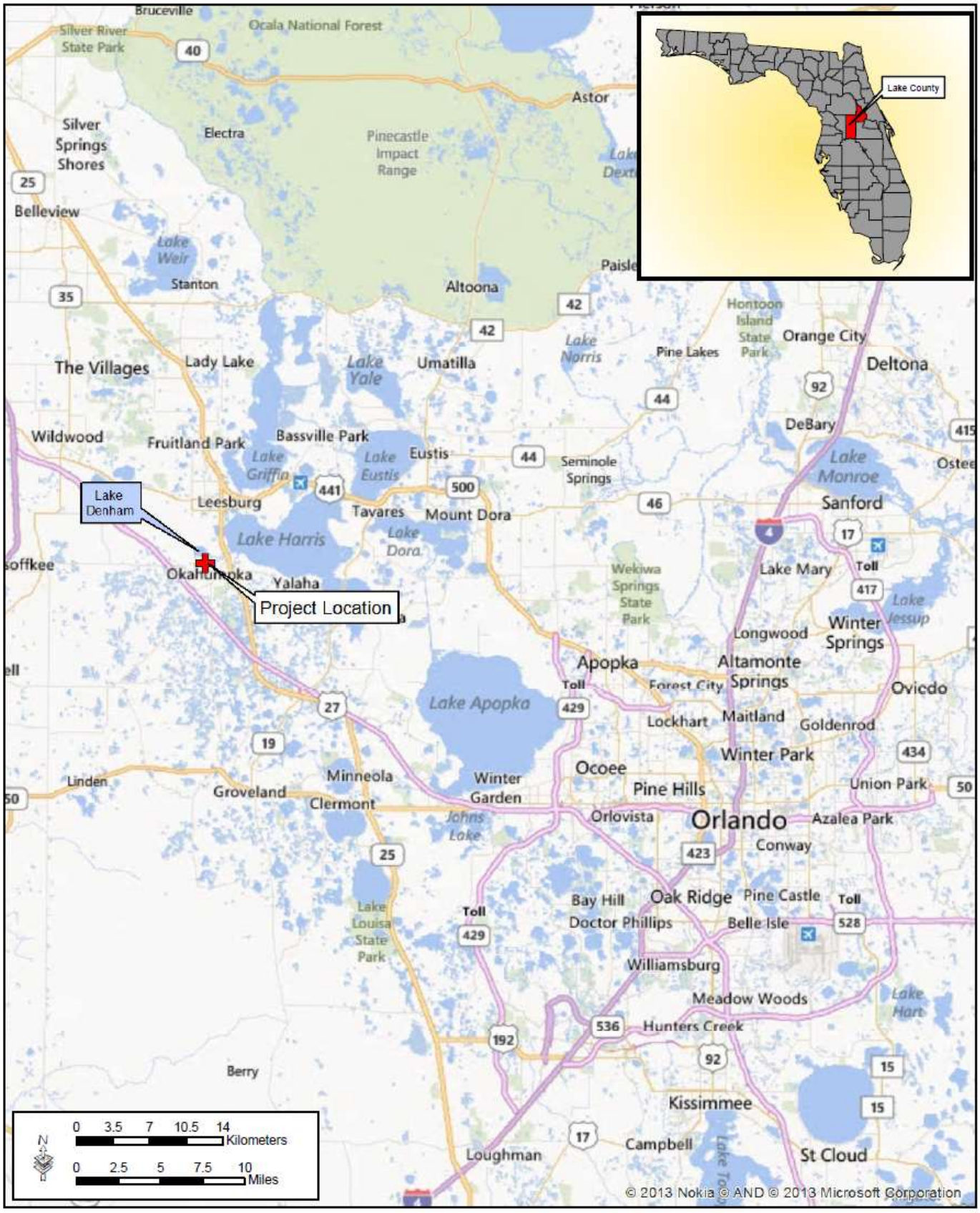

Figure 1-1. LEFAC/Bugg Spring Project Vicinity Map

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uses, including basic information on the LEFAC/Bugg Spring facility, as well as the physical and biotic environments found there. Section 3 discusses the military mission, mission sustainability, environmental compliance requirements, and potential partnerships. Section 4 outlines the ecosystem management elements and relates them to the goals, objectives, strategies, and projects. Section 5 describes INRMP implementation including projects, cooperative agreements, and funding. A crosswalk list is included in Table ES-3 to assist readers of this plan with finding particular topics of interest. A list of acronyms and abbreviations used in the INRMP is provided following the Table of Contents.

1.2 SCOPE

This INRMP provides guidance for natural resources management on the Navy-owned land at LEFAC/Bugg Spring (Figure 1-2). It includes information on rare, threatened, and endangered (RTE) species, wetlands, invasive species, erosion and water pollution, and other aspects of the natural environment. Appropriate and effective management of natural resources on Navy land will be achieved in accordance with the principles and practices of ecosystem management. Ecosystem management includes the following:

- Recognizing and defining the problems or opportunities
- Delineating boundaries
- Identifying and involving participants
- Establishing a common vision
- Assessing ecological, economical, and social constraints and opportunities
- Acquiring funding
- Making decisions and implementing solutions
- Monitoring progress, evaluating impacts, and adapting based on new information (The Keystone Center, 1996).

These steps do not necessarily take place in a particular sequence and often occur parallel with each other and can be repeated as the process evolves.

This is not an integrated pest management plan, hazardous waste plan, or stormwater pollution prevention plan. This INRMP is appropriate for a 5-year period and has the dual purpose of complying with environmental laws and regulations while supporting the military mission of the Navy. Annual reviews will ensure that this INRMP includes the latest scientific knowledge and meets the requirements of the installation’s military mission.

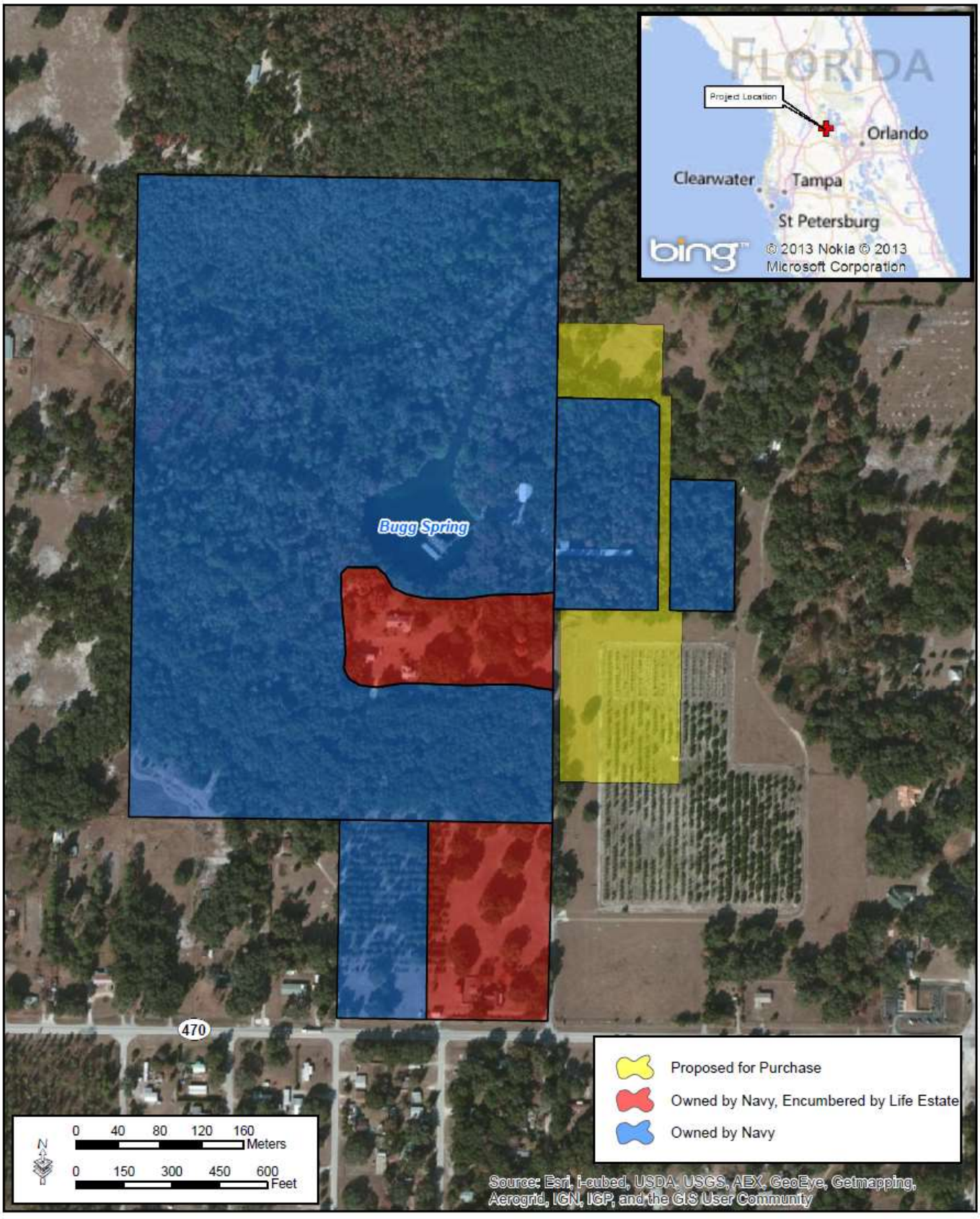

Figure 1-2. LEFAC/Bugg Spring Project Area Map

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1.3 GOALS AND OBJECTIVES

The development and implementation of the INRMP is a dynamic, multidisciplinary planning process that incorporates as its primary goal the support and maintenance of the military mission while managing, protecting, and enhancing the biological integrity of military lands and waters. Management objectives are defensible targets or specific components of a goal, the achievement of which represents measurable progress toward that goal. The INRMP creates an ecosystem-based conservation program that provides for conservation and rehabilitation of natural resources in a manner that is consistent with the military mission, integrates and coordinates all natural resources management activities, provides for sustainable multipurpose uses of natural resources, and provides military personnel with access to natural resources subject to safety and military security considerations.

1.4 RESPONSIBILITIES

Naval Support Activity (NSA) Orlando is responsible for ensuring that the LEFAC/Bugg Spring INRMP complies with DoD, Navy, and CNO policy. NSA Orlando is also responsible for the associated National Environmental Policy Act (NEPA) document preparation, revision, and implementation, and for ensuring that the LEFAC/Bugg Spring INRMP undergoes annual reviews and updates projects, goals, and objectives as needed to provide integrated adaptive resource management.

The NSA Orlando Commanding Officer (CO) is responsible for the preparation, completion, and implementation of this INRMP and associated NEPA documents for the LEFAC/Bugg Spring facility and systematically applying the conservation practices set forth in this INRMP. The CO's role is to act as the steward of natural resources under his jurisdiction and integrate natural resources management requirements into the daily decision-making process. Because NSA Orlando does not have a Natural Resources Manager and due to the small size of the LEFAC/Bugg Spring facility, natural resources management will be performed by the natural resources staff of Commander, Navy Region Southeast, Jacksonville, Florida, in coordination with NSA Orlando staff. The CO will ensure natural resources management and this INRMP comply with all natural resources-related legislation, Executive Orders (EO) and Executive Memorandums, and DoD, Navy, and CNO directives, instructions, and policies. Natural resources management, when applicable, will also involve appropriate tenant, operational, training, or research and development commands in the INRMP review process to ensure no net loss of military mission. In addition, the CO will coordinate with appropriate Navy Judge Advocate General (JAG) or Office of the General Counsel to provide advice and counsel with respect to

legal matters related to natural resources management and this INRMP, and endorse this INRMP via signature. FWC and USFWS are considered external stakeholders.

1.5 AUTHORITY

The INRMP is written to meet the requirements of the SAIA of 1997 (16 U.S.C. Sec. 670a et seq.) and the requirements of the DoD Environmental Conservation Program (DoDINST 4715.3). It also incorporates guidance given in OPNAVINST 5090.1C, the Navy Environmental Protection and Natural Resources Manual, and the NAVFAC Real Estate Procedural Manual (NAVFAC P-73).

1.6 STEWARDSHIP AND COMPLIANCE

The natural resources management program at the LEFAC/Bugg Spring facility must meet sustainability needs and compliance requirements. Sustainability projects are based upon the land management responsibility of the Navy and are not required to be implemented to meet regulatory needs. Compliance projects are mandatory, and implementation is required to comply with laws and regulations that apply to lands and operations at the LEFAC/Bugg Spring facility.

The LEFAC/Bugg Spring facility considers its stewardship and compliance responsibilities during the planning of natural resources management and Navy operations at the LEFAC/Bugg Spring facility. During the preparation of this INRMP, existing information was consolidated and analyzed and field surveys were performed to assess the natural resources present on the LEFAC/Bugg Spring facility. After filling in data gaps and establishing what resources are present and what issues exist, it was possible to determine what actions are necessary to meet compliance requirements. For example, surveys were performed for RTE species on the LEFAC/Bugg Spring facility. The results of those surveys indicate where gopher tortoise (*Gopherus polyphemus*) burrows occur so that impacts on them can be avoided and management strategies that benefit them can be implemented.

1.7 REVIEW AND REVISION PROCESS

NSA Orlando must complete an annual evaluation of the effectiveness of INRMP implementation. The evaluation can be readily completed using the conservation website that is part of the Navy Environmental Programs Requirement system (EPRweb), https://eprportal.cnic.navy.mil. Annual reviews and updates of the LEFAC/Bugg Spring INRMP will result in revisions as appropriate.

There are seven focus areas that comprise the metrics in annual evaluations:

1. Ecosystem Integrity- evaluate the current status, management effectiveness, and trends of the ecosystems at the installation.
2. Listed Species and Critical Habitat- evaluate the extent to which Federally listed species have been identified on the installation and the extent to which the INRMP provides conservation benefits to these species and their habitats.
3. SAIA Cooperation- determine to what degree the partnerships are cooperative and result in effective INRMP development and review.
4. Recreational Use and Access- evaluate the availability and adequacy of public recreational use opportunities such as fishing, hunting, and disabled person access, noting security and safety requirements.
5. Team Adequacy- the adequacy of the installation's team to manage natural resources and accomplish the goals of the INRMP.
6. INRMP Implementation- evaluate the execution of actions taken to meet INRMP goals.
7. INRMP Support of the Installation Mission- evaluate the level to which existing natural resources requirements support the installation's ability to sustain the current operational mission with no net loss of mission capability.

1.8 MANAGEMENT STRATEGY

In the 1990s, DoD reviewed its natural resources management philosophy in an attempt to improve performance through new management techniques. On 8 August 1994, OUSD issued a policy directive for the *Implementation of Ecosystem Management in the DoD*. This policy directive provides an important change in the philosophy of how DoD will manage its lands and resources. The policy directive states the following:

> ...ecosystem management will include: a shift in focus from the protection of individual species to management of ecosystems (ecological approach); formation of partnerships to achieve shared goals (partnerships); public participation in decision making (participation); use of the best available science in decision making (information); implementation of adaptive management techniques (adaptive management) (Goodman 1994).

An ecosystem is a dynamic and natural complex of living organisms interacting with each other and with their associated nonliving environment. Ecosystem management is a goal-driven approach to managing natural resources that supports present and future mission requirements; preserves ecosystem integrity; is at a scale compatible with natural processes; is cognizant of nature’s time frames; recognizes social and economic viability within functioning ecosystems; is adaptable to complex and changing requirements; and is realized through effective partnerships

among private, local, state, tribal, and Federal interests. Ecosystem management is a process that considers the environment as a complex system functioning as a whole, not as a collection of parts, and recognizes that people and their social and economic needs are a part of the whole. This INMRP and the implementation of its projects provide for ecosystem management at the LEFAC/Bugg Spring facility. The INRMP takes into account specific projects and techniques that serve to manage the ecosystem and maintain biological diversity at a landscape scale. The development and implementation of the INRMP is a dynamic, multidisciplinary planning process that incorporates as its primary goal the support and maintenance of the military mission while managing, protecting, and enhancing the biological integrity of military lands and water resources.

Natural resources management on the LEFAC/Bugg Spring facility is achieved through adaptive and cooperative management strategies. Adaptive management is a systematic approach for continually improving management practices by learning from the outcome of projects, programs, and other experiences. Adaptive management involves testing, monitoring, and evaluating applied strategies, and incorporating new knowledge into management approaches that are based on scientific findings and the needs of society. Results are used to modify management policy, strategies, and practices. The Navy developed a web-based Metric Builder to measure how well installations are implementing INRMPs and overall ecosystem health as it relates to mission sustainability. The Metrics Builder provides a standard method for collecting and reporting data and facilitates evaluation of performance in INRMP reviews and updates. It can be applied to completed and ongoing projects, natural resource practices, and new proposals.

Cooperative management refers to management strategies between government agencies for responsible resource stewardship. In cooperative management, representatives of government agencies share information, resources, and responsibility. USFWS, FWC, and the Navy will cooperatively manage the natural resources at the LEFAC/Bugg Spring facility and strive to meet the military mission, while conserving and enhancing the natural resources of the base.

1.9 OTHER PLAN INTEGRATION

The Navy strives to integrate INRMPs with other related or overlapping plans whenever possible. The Florida State Wildlife Action Plan (FWC 2012a) was referenced and incorporated into this INRMP. It described threats and provided potential conservation actions, ranked by feasibility, benefits, and costs, for multiple habitats on the LEFAC/Bugg Spring facility. A regional river basin management action plan (Upper Ocklawaha Basin Working Group 2007) was also analyzed and incorporated into this INRMP, where appropriate. Previously, an INRMP was prepared that covered 7.45 acres of the LEFAC/Bugg Spring facility (Naval Undersea Warfare Center [NUWC]

1997); however, the limited area that the previous INRMP covered contained little undeveloped land where natural resources management projects could be implemented.

There is no Bird/Wildlife Aircraft Strike Hazard plan for the LEFAC/Bugg Spring facility at this time, as no aircraft operate at the facility. No Integrated Pest Management Plan or base landscaping plan currently exists. The proposed acquisition of additional parcels adjacent to the LEFAC/Bugg Spring facility is described in Section 2.1.7- Opportunities.

USFWS and FWC are important partners in the INRMP review and revision process. The Navy coordinated site visits with USFWS and FWC and solicited comments and input on the Draft INRMP. Their recommendations will be integrated into future drafts of this INRMP and they will also have the opportunity to review and comment on the proposed implementation of the INRMP during the NEPA process.

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2.0 CURRENT CONDITIONS AND USE

2.1 INSTALLATION INFORMATION

2.1.1 General Description

The LEFAC/Bugg Spring facility is located in Lake County, Florida, immediately northwest of Okahumpka, about 3.5 miles south of Leesburg, and about 40 miles northwest of the City of Orlando (see Figure 1-1). The facility surrounds a natural sinkhole lake formed by Bugg Spring that is approximately 400 feet in diameter and used by the Navy for calibration and testing of sonar equipment. The lake is fed by Bugg Spring, which emanates from the lake bottom. The hydrologic characteristics of Bugg Spring make it uniquely suited for Navy testing and calibration and the majority of the Navy activity on the LEFAC/Bugg Spring facility occurs on and in the Bugg Spring sinkhole lake.

This INRMP covers the approximately 78 acres of land owned by the Navy, with Bugg Spring situated near the center of the facility (see Figure 1-2). An additional approximately 7 acres of land adjacent to the Navy facility is proposed for purchase by the Navy and is not addressed in this INRMP (see Figure 1-2). The majority of the LEFAC/Bugg Spring facility is vegetated and undeveloped and provides a buffer area around the sinkhole lake. Bugg Spring Road is covered with crushed stone and is the only connecting road to nearby streets. Internal dirt roads on the LEFAC/Bugg Spring facility extend from Bugg Spring Road to each of the houses, and a few old and overgrown dirt roads extend into the upland forest south of the Bugg Spring sinkhole lake. There are no internal roads or paths north of Bugg Spring. Forests surrounding the Bugg Spring sinkhole lake obscure most views of the Navy buildings, with the southern side of the lake being the most exposed and least vegetated.

The areas immediately to the west, south, and east of the LEFAC/Bugg Spring facility are primarily single-family residences among small agricultural fields and pasture. There is an old and mostly dead citrus orchard where honey bee boxes are occasionally stored on the neighboring parcel to the southeast. The land immediately north of the LEFAC/Bugg Spring facility is mostly undeveloped marsh and forested wetland/upland. There is a medium-density residential community containing over 100 manufactured homes approximately 0.3 mile northeast of Bugg Spring. About 0.25 mile to the southeast of the LEFAC/Bugg Spring facility is Okahumpka, a census-designated place with a population of 267 people according to the 2010 census. Lake County had a population of 297,052 in 2010.

The LEFAC/Bugg Spring facility had been leased to the Navy by Dr. Joe Branham since 1958. In December 2011 the land was purchased by the Navy. According to the terms of the sale, Dr. Branham and his wife are allowed to use the three existing houses and associated outbuildings and grounds for the remainder of their lives. The houses and their grounds cover approximately 10.5 acres, in two parcels, that are encumbered by restrictive easements held jointly by Joseph M. Branham, Trustee of the Joseph M. Branham Family Trust, and Margaret Taylor Branham, Trustee of the Margaret Taylor Branham Family Trust (see Figure 1-2). These parcels are predominantly manicured grass lawn with some mature shade trees. The easements prevent any improvement, development, or use of the LEFAC/Bugg Spring facility that would be incompatible with the Navy mission.

The Navy maintains a fully instrumented floating platform (Photograph 2-1) on the sinkhole lake with workshops and infrastructure to support underwater sonar testing. Adjacent to the Bugg Spring sinkhole lake and test platform is a shore site with an office, storage buildings, and a workshop. The remainder of the facility is generally in a natural state. Figure 2-1 shows the location of the major buildings on the LEFAC/Bugg Spring facility. The Navy buildings and residences utilize septic systems and are not connected to sewers.

Photograph 2-1. Sinkhole Lake and Floating Navy Platform (Source Naval Sea Systems Command 2013)

2.1.2 Military Mission

The mission of the LEFAC/Bugg Spring facility is to provide acoustic calibration, test, and evaluation reference measurements on acoustic transducers and materials. This facility provides the Navy and its contractors with the ability to apply state-of-the-art advances to the metrology and instrumentation used in these services and to perform research and development in the general area of acoustics, transduction, and underwater acoustics for the Navy, U.S. Government, or public interests.

The LEFAC/Bugg Spring is the On-Site Office, Okahumpka, of the NUWC Division Newport. NUWC is a shore command of the Navy within the Naval Sea Systems Command (NAVSEA) Warfare Center Enterprise, which engineers, builds, and supports the Navy's fleet of ships and combat systems. NAVSEA strives to be an efficient provider of defense resources

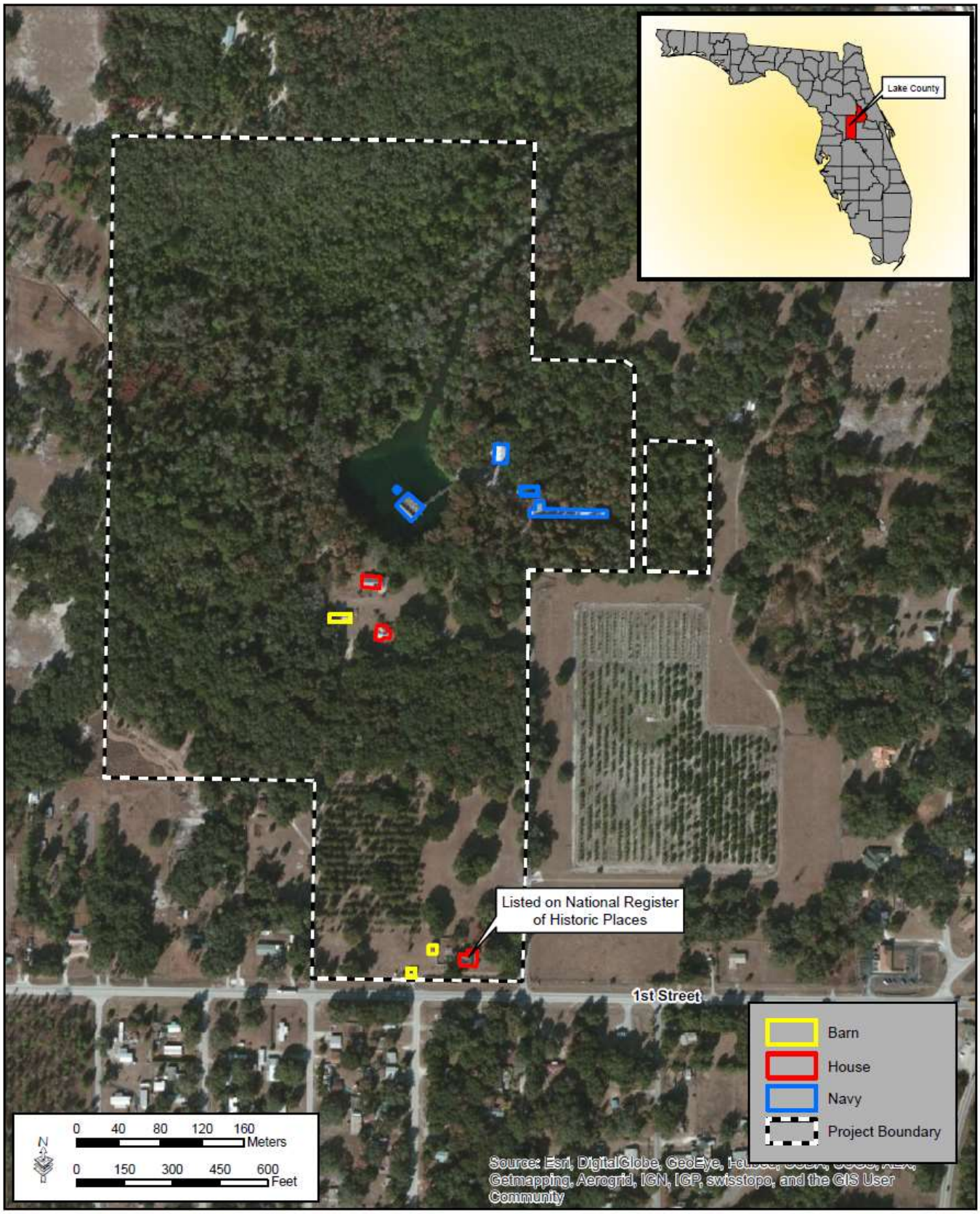

Figure 2-1. Major Buildings on LEFAC/Bugg Spring Facility

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for the Nation and it plays an important role in the Navy. It has the responsibility of directing resource sponsors into the proper mix of manpower and resources to properly equip the fleet, as well as the responsibility of establishing and enforcing technical authority in combat system design and operation.

The LEFAC/Bugg Spring facility was established in 1966 by the Underwater Sound Reference Division (USRD) of the Naval Research Laboratory in response to a need for a quiet deep water facility to calibrate Navy towed arrays and other low frequency acoustic devices. NUWC Detachment Bugg Spring is the Navy's principal activity for calibration of tactical submarine towed arrays. It also performs acoustic evaluation measurements on a variety of developmental towed arrays both for the submarine and the surface ship community.

LEFAC/Bugg Spring is a unique facility for the calibration of transducers and sonar equipment because it possesses a rare combination of hydrologic characteristics. The lake is relatively deep and wide enough to house an array of transducers/receivers. Ambient noise in the lake is extremely low, below sea state zero, because it is located in a rural area, surrounded by noise dampening vegetation, and is encased in bedrock. Water flows consistently year-round without the need for pumps that would create noise. The flow rate is high enough that water in the lake mixes evenly, showing no significant thermocline, halocline, or other changes in composition or density that could interfere with sonar testing. The flow rate is gentle enough that there is almost no turbidity and no boil on the water surface. All these factors combined, make a low noise and homogenous body of water that is ideal for fine-tuned sonar calibration. The shape and location of the sinkhole lake and the water quality and quantity from Bugg Spring are vital attributes that allow the LEFAC/Bugg Spring facility to execute its mission. The unique hydrologic features are not naturally reproducible, and a man-made alternative would be cost-prohibitive.

2.1.3 Operations and Activities

The Navy utilizes the LEFAC/Bugg Spring facility for testing and calibration of sensitive acoustic and sonar equipment. This work is predominantly performed from a floating platform on the Bugg Spring sinkhole lake that is connected to the shore by a foot bridge. A rolling conveyor, structural supports, booms, and boat ramp are available for moving equipment into and around the Bugg Spring sinkhole lake. Most of the testing occurs under the water surface and involves long cables with arrays of transducers, hydrophones, and other electronics. No significant quantities of hazardous materials are used on-site and no weapons testing or practice occurs at the LEFAC/Bugg Spring facility. Navy activities at the LEFAC/Bugg Spring facility generally do not extend beyond the Bugg Spring sinkhole lake, boat ramp, and office/storage building area. Deliveries by truck are received at the Navy buildings adjacent to Bugg Spring (see Figure 2-1).

The activities on and in the Bugg Spring sinkhole lake typically consist of extending cables mounted with various electronics into the water and performing acoustic tests. Occasionally divers or remote-controlled underwater vehicles operate in the lake. Underwater testing at the LEFAC/Bugg Spring facility is sporadic (not a daily occurrence) and there is a low likelihood that it is detrimental to the LEFAC/Bugg Spring facility's natural resources.

The Branham family occupies houses and maintains the residential grounds on two parcels in the southern half of the facility (see Figure 2-1). The remaining land, especially the northern half of the facility, receives little to no human visitation or use, but is important as a buffer to dampen noise and ensure privacy.

2.1.4 Abbreviated History and Pre-military Land Use

There is a long history of human habitation and use associated with Bugg Spring. Clarence B. Moore reportedly totally excavated a Native American mound near Bugg Spring, producing evidence of human use estimated to A.D. 1100 to 1300 (Mitchem 1996). Bugg Spring is one of the postulated sites of the early nineteenth century Seminole Indian town of Okahumpka. Following the American Civil War, the Confederate officer J.J. Dickison built a house near Bugg Spring where he lived from approximately 1880 to 1889. His house still stands on the LEFAC/Bugg Spring facility, along with another house built during the same era (see Figure 2-1). As early as 1923, the land around Bugg Spring was in the possession of the Branham family, who built a third house on the property. Figure 2-2 shows historical aerial images of the Bugg Spring area across several decades, starting in 1941.

2.1.5 Regional Land Uses

Most of the land within 2 miles to the north of the LEFAC/Bugg Spring facility is undeveloped. Bugg Spring flows from the LEFAC/Bugg Spring facility toward the north and feeds into a wooded and wetland area known as the Okahumpka Marsh. The marsh complex opens in some areas to form Lake Denham (670 acres), which flows into the much larger Lake Harris (13,788 acres) (see Figure 1-1). Portions of the Okahumpka Marsh and two islands are protected as the Flat Island Preserve, established by the Lake County Water Authority. This preserve protects wildlife habitat and marsh that feeds water to the Floridan aquifer and to downstream human users in the St. Johns River watershed.

In upland areas of Lake County, particularly to the south of the LEFAC/Bugg Spring facility, lakes and ponds are common and agricultural uses such as citrus and cattle/horse ranching dominate much of the non-residential land. Orlando is the closest major city and is approximately 40 miles

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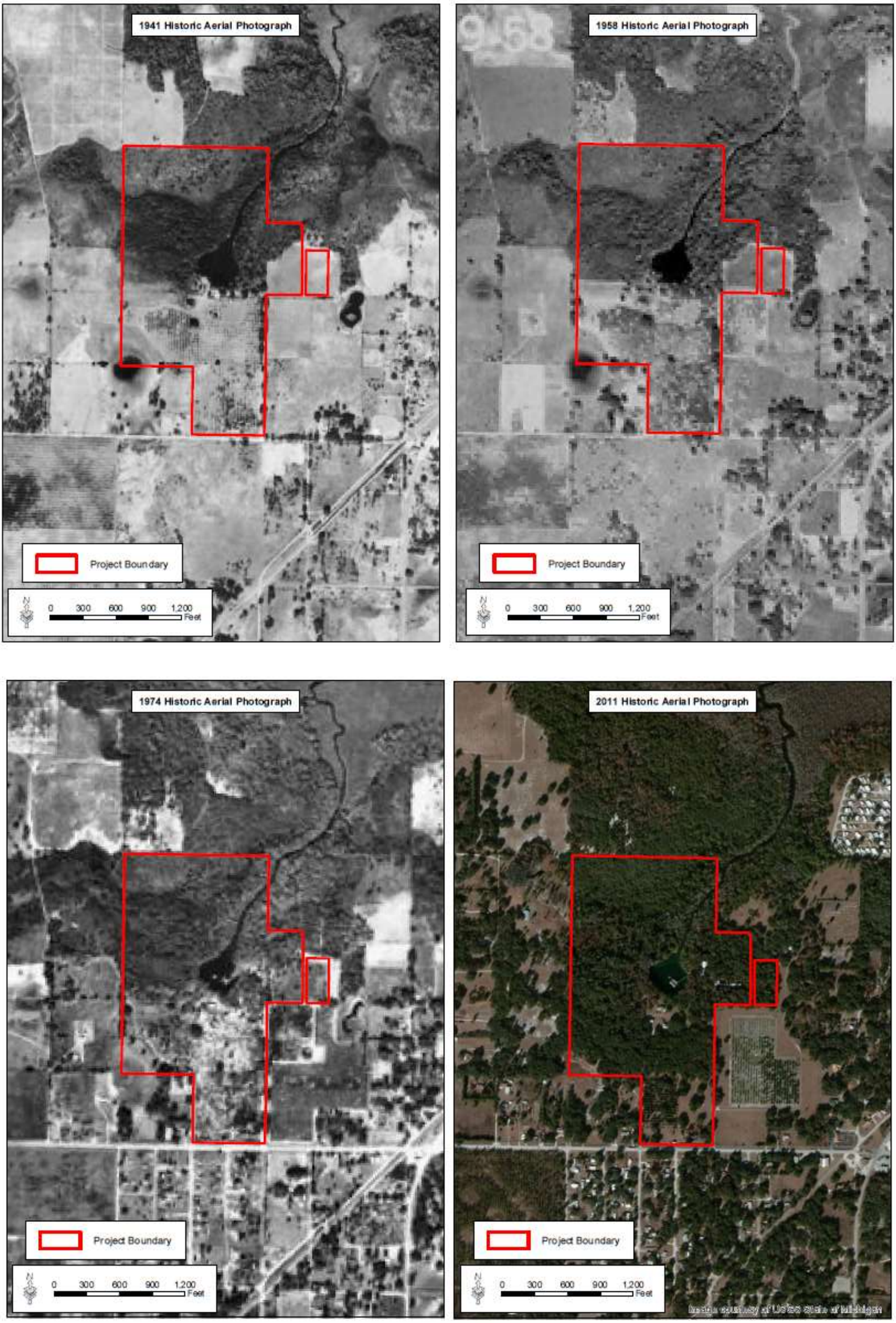

Figure 2-2. Historical Aerial Imagery of LEFAC/Bugg Spring

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to the southeast. The City of Leesburg (population 20,125) is about 4 miles to the north. Leesburg operates a wastewater treatment facility where partially treated wastewater is discharged onto the land surface approximately 0.5 mile southwest of Bugg Spring. Peat and sand mining are common in the region. The C & C Peat Company operates a 20-acre facility for composting and mixing peat approximately 1.6 miles west of Bugg Spring; however, the peat is not mined at this site.

2.1.6 Constraints

Navy activities on the LEFAC/Bugg Spring facility are constrained in multiple areas shown in Figure 2-3. Two parcels are encumbered by easements allowing the previous landowner to live in houses and use grounds on the LEFAC/Bugg Spring facility. The Campbell House, next to County Road 470, is listed on the National Register of Historic Places (NRHP) and the two houses near the Bugg Spring sinkhole lake are NRHP-eligible. The grounds around these houses are landscaped and the previous landowners continue to use a small dock and a canoe launch on the southern shore of the Bugg Spring sinkhole lake. Much of the LEFAC/Bugg Spring facility that is not encumbered by easements falls within the 100-year floodplain (Figure 2-3) and construction in this zone is restricted.

Natural resources are closely tied to the suitability of Bugg Spring for the Navy's mission and they place some constraints on Navy activities at the LEFAC/Bugg Spring facility. The sinkhole lake and spring-run stream are considered waters of the U.S., and the expanse of wetlands that stretch across the central portion of the LEFAC/Bugg Spring facility is likely to be considered jurisdictional wetlands (Figure 2-4). Potential impacts on both waters of the U.S. and jurisdictional wetlands require permits from the U.S. Army Corps of Engineers (USACE) before construction or development. Additionally, the sinkhole lake and spring-run stream are also considered waters of the state and Florida Department of Environmental Protection (FDEP) claims jurisdiction over areas it considers wetlands; so, consultation with and permits from the state would also be necessary. Installing a security fence around the LEFAC/Bugg Spring facility would also be complicated by the dense wetlands and need to span a spring-run stream. Currently there is a chain-link fence partially crossing the spring-run stream to discourage boat traffic from accessing the Bugg Spring sinkhole lake.

Some portions of the LEFAC/Bugg Spring facility contain habitat for protected species, such as gopher tortoises and limpkins (*Aramus guarauna*). Limpkins are migrating birds that are listed as a Florida Species of Special Concern. Gopher tortoise is a Candidate species under the Endangered Species Act and is listed as Threatened by the State of Florida. The locations of known gopher tortoise burrows on the LEFAC/Bugg Spring facility are shown on Figure 2-3.

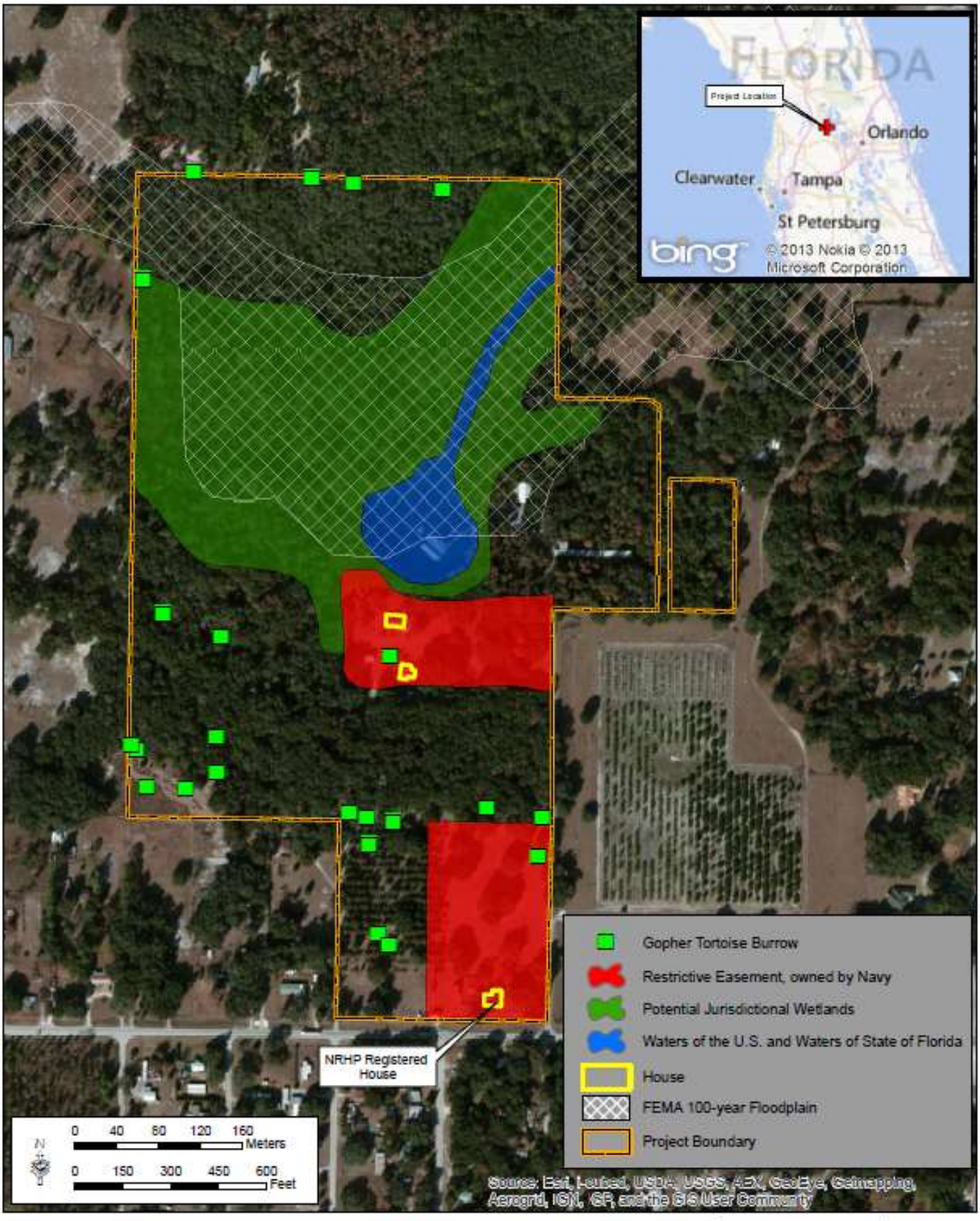

Figure 2-3. LEFAC/Bugg Spring Constraints Map

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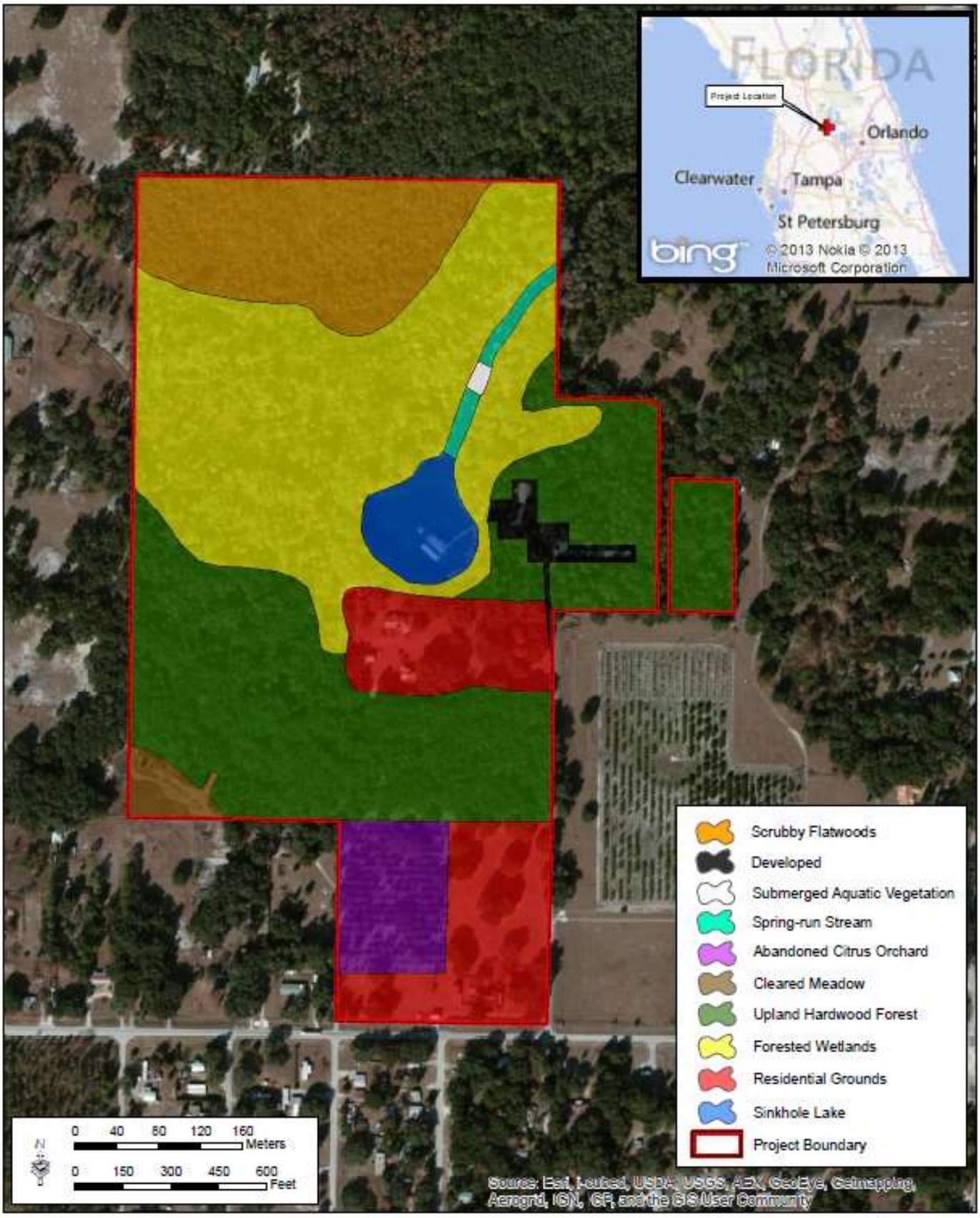

Figure 2-4. Habitat on LEFAC/Bugg Spring

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Limpkins are listed as a Species of Special Concern by the State of Florida and take of limpkin, their nests, or eggs is prohibited. On the LEFAC/Bugg Spring facility limpkins are associated with the areas immediately around and in the sinkhole lake and spring-run stream. Limpkin and other migratory birds are also protected under the Migratory Bird Treaty Act (MBTA).

The LEFAC/Bugg Spring facility depends on the natural flow of water from Bugg Spring and that flow is dependent on areas and activities distant from the spring itself. Spring flow rates, including the flow at Bugg Spring, are largely the result of a balance between the amount of water flowing into the aquifer through the recharge zone and the amount of water flowing out at springs and seeps, plus water pumped out through wells. Very little filtering occurs as surface water recharges and flows through the aquifer, so contaminants on the surface can easily enter and be transported long distances.

Because of this relationship, water quantity and quality at the spring outflow are directly related to inputs in the recharge area and aquifer withdrawals through wells. Aquifer composition, local recharge areas, and subterranean water flow are discussed in more detail in Section 2.2.2.

As human demand increases withdrawals from the aquifer, reduced spring flows could occur, potentially affecting the utility of Bugg Spring as a testing facility. However, this is unlikely in the foreseeable future due to the extremely high flow rate of Bugg Spring and because Bugg Spring's proximity to the recharge zone immediately upgradient allows it to capture water before many downstream users are able to pump it out of the ground. Significant decline in aquifer levels would likely be required before problematic spring flow reductions at Bugg Spring were realized.

A narrow band of privately owned property connecting to larger tracts, shown in Figure 1-2, divides part the eastern edge of the LEFAC/Bugg Spring facility. Plans exist for the Navy to purchase this land. Further expansion of the LEFAC/Bugg Spring facility into other neighboring lands is constrained by rural residential and agricultural land uses to the south, east, and west, and to the north by wetlands associated with the Okahumpka Marsh.

2.1.7 Opportunities

Most of the LEFAC/Bugg Spring facility is constrained in some way; however, a neighboring property offers opportunities for expansion and construction of a proposed truck turn-around that would not affect native habitat. Approximately 7 acres have been proposed for purchase and incorporation into the LEFAC/Bugg Spring facility (Figure 2-5). Navy ownership of this parcel would enlarge the buffer of land that provides privacy at the Bugg Spring sinkhole lake and would make all LEFAC/Bugg Spring lands contiguous (currently a small strip of privately owned land

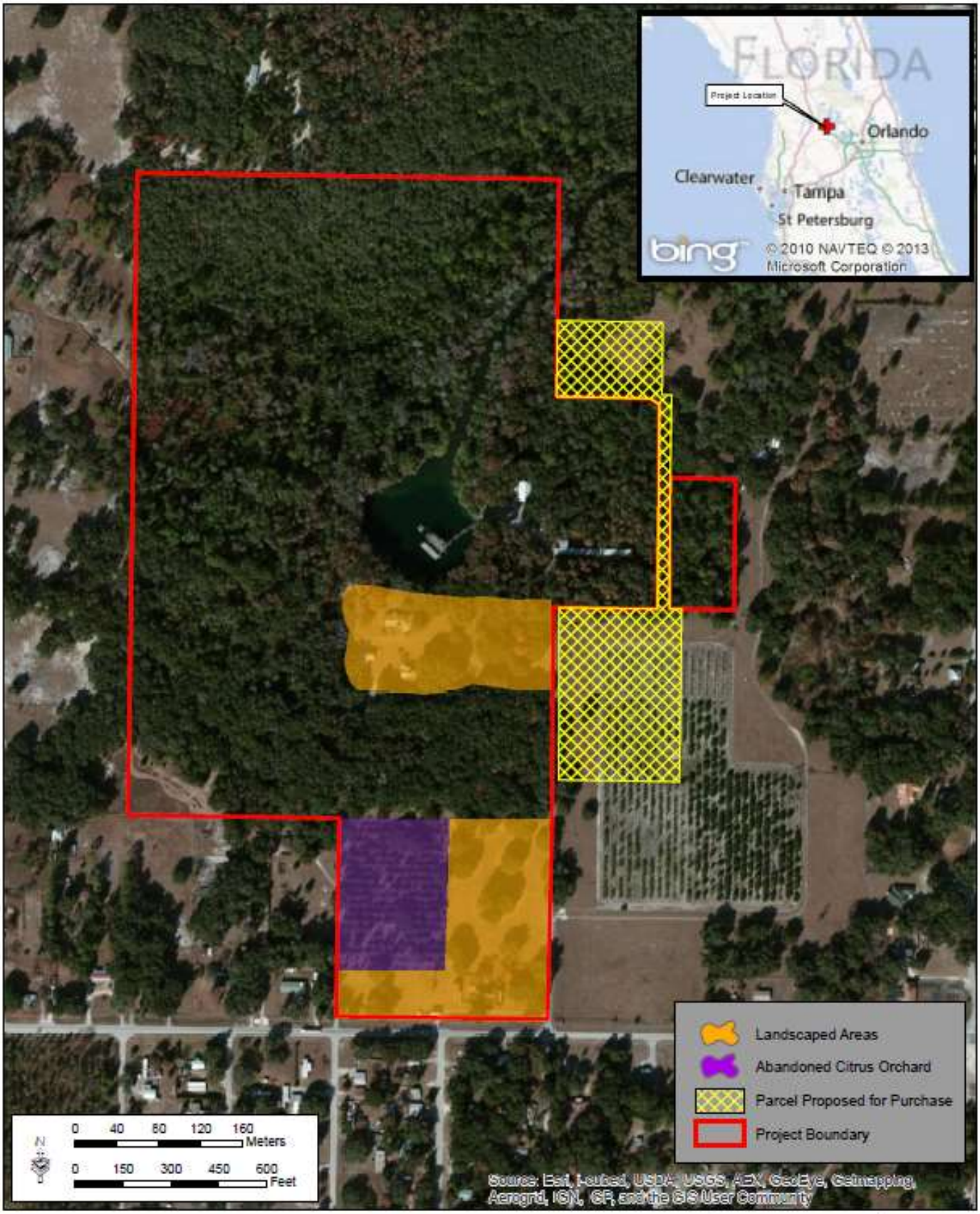

Figure 2-5. Opportunities Map

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separates the easternmost parcel from the rest of the LEFAC/Bugg Spring facility). Acquiring the additional parcel could also help ensure that the land remains in a vegetated state, which would help maintain low noise levels in the Bugg Spring sinkhole lake.

The southern portion of the property proposed for acquisition is an abandoned citrus orchard that occasionally houses some bee boxes. Those bee boxes are mobile and the orchard is not otherwise in active agricultural use at this time. Part of this area could be vegetated to further conceal the Bugg Spring sinkhole lake and Navy buildings, and a truck turn-around could be installed without the need to remove mature oak (*Quercus* spp.) trees or native vegetation.

The parcels that are currently owned by the Navy and under a restrictive easement are predominantly landscaped with manicured grass lawns. When no longer encumbered by easements, these landscaped areas will offer space for new construction or Navy activities that will not require clearing native habitat. The citrus orchard in the southwestern portion of the LEFAC/Bugg Spring facility is not actively maintained and could also be developed (if steps to avoid impacts on gopher tortoise are taken). These areas could also be managed for native species and revegetated to enhance privacy and noise dampening, as well as to provide wildlife habitat.

2.2 GENERAL PHYSICAL ENVIRONMENT AND ECOSYSTEMS

2.2.1 Climate

The LEFAC/Bugg Spring facility is located in a subtropical climate, but occasionally experiences winter freezes. The mean annual temperature is 72.8 degrees Fahrenheit (^{o}F). January is usually the coolest month with a mean minimum monthly temperature of 60.2^{o} F. The mean maximum monthly temperature typically occurs in July or August. Annual precipitation averages 50.73 inches (Florida Climate Data Center 2012) and relative humidity is generally high, averaging 90 percent in the morning and 50 percent in the afternoon (National Climate Data Center 2012).

2.2.2 Geology and Hydrology

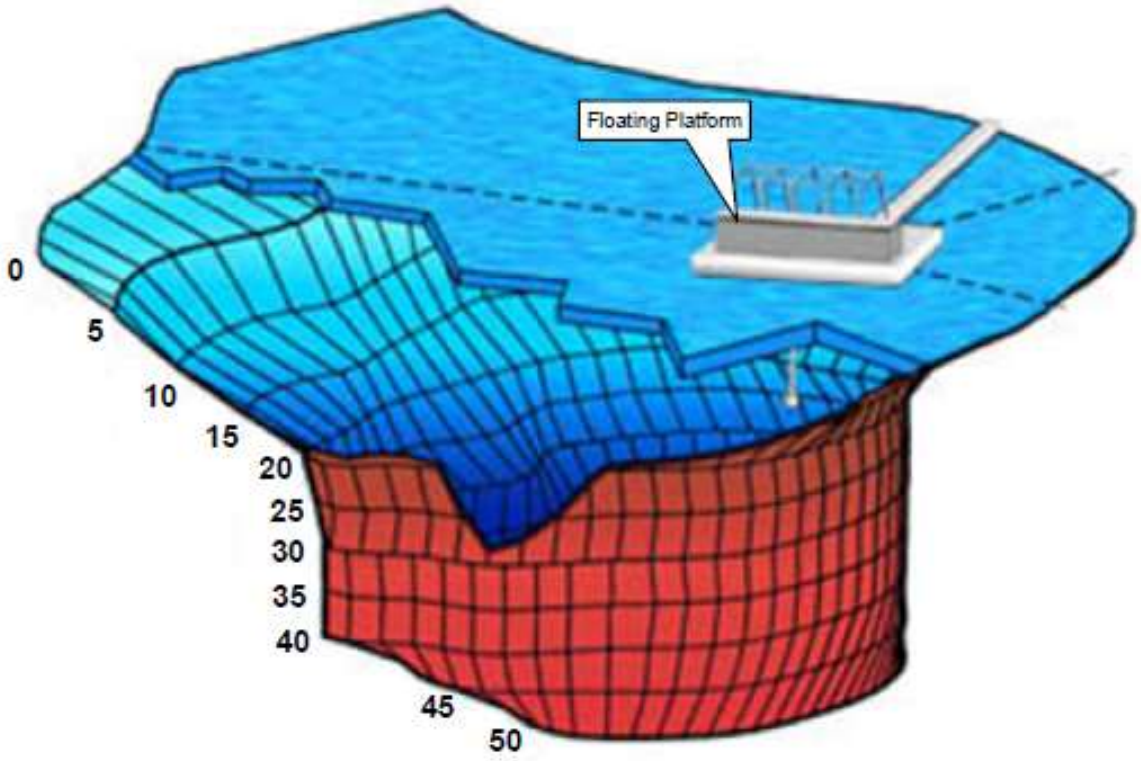
The Florida Peninsula is a large limestone plateau that formed beneath a shallow sea about 55 million years ago. Central Florida is karst landscape composed of limestone in the Ocala group and is topped in most areas with a confining layer of clay known as the Hawthorn formation. The Ocala uplift, in north-central Florida, stretches from around Brooksville north to Live Oak, running parallel and west of Interstate 75. In the Ocala Uplift, rolling hills and exposed limestone are common, because the capping layer of Hawthorn Formation clays have been weathered and

eroded away. This exposes the relatively soft limestone and enhances the formation of caves and sinkholes. As the Ocala Uplift slopes down to the east, towards Bugg Spring and the central portion of the state, the Hawthorn layer becomes thicker and there are fewer dry caves. Water that falls on the Ocala Uplift typically recharges into the aquifer via karst features and reemerges at downgradient seeps and springs, like Bugg Spring (Florida Speleological Society 2012).

Bugg Spring forms a lake about 400 feet in diameter and 174 feet deep with near-vertical walls that slope down to a spring outflow at the bottom of the lake (Figure 2-6). The extent of the springshed is 10.1 square miles and the estimated age since the spring water entered the aquifer is less than 50 years (Walsh et al. 2009). Bugg Spring has a mean and median discharge of 11.2 and 10.3 cubic feet per second (ft^3/s), respectively, making it a second-magnitude spring (Walsh et al. 2009). Second-magnitude springs have a flow rate between 10 and 100 ft^3/s. Approximately 70 springs in Florida are second-magnitude, and they account for 21 percent of the total discharge from all known Florida springs (U.S. Geological Survey [USGS] 2013b). The geology in the vicinity of Bugg Spring is predominantly Cypresshead Formation of Pliocene age, as well as Holocene sediments (Florida Geologic Survey 2012).

Bugg Spring is one outflow of a massive system of subterranean water-filled voids known as the Floridan Aquifer. The aquifer stretches across Florida and parts of southern Alabama, Georgia, and South Carolina. It varies in depth from being near the surface to approximately 1,000 feet below ground. In recharge areas, the surface geology is porous and composed of minerals that water dissolves away, leaving interconnected voids from the surface that lead down to the aquifer. Water that falls or flows on the recharge area may percolate through the rock and flow through the voids, recharging water into the aquifer. In other areas, the aquifer is confined by layers of impermeable rock and no recharge occurs. Water flowing down gradient exits the aquifer at spring or seeps, or is pumped out through wells.

Water flows through the aquifer from areas of high potentiometric surface gradients (usually near recharge areas) to areas with lower potentiometric gradients (where many springs occur). Figure 2-7 shows potentiometric surface contours in central Florida and indicates that water emanating from Bugg Spring flows north or northwest while underground. Figure 2-8 shows the recharge zones in Lake County, Florida. The nearest area mapped as recharge zone is over 1,300 feet from Bugg Spring, but it is likely that the spring water entered the recharge zone from further away, in northern Polk County or southern Lake County, Florida.



Source: NAVSEA 2013

Figure 2-6. Wireframe Map of LEFAC/Bugg Spring Sinkhole Lake

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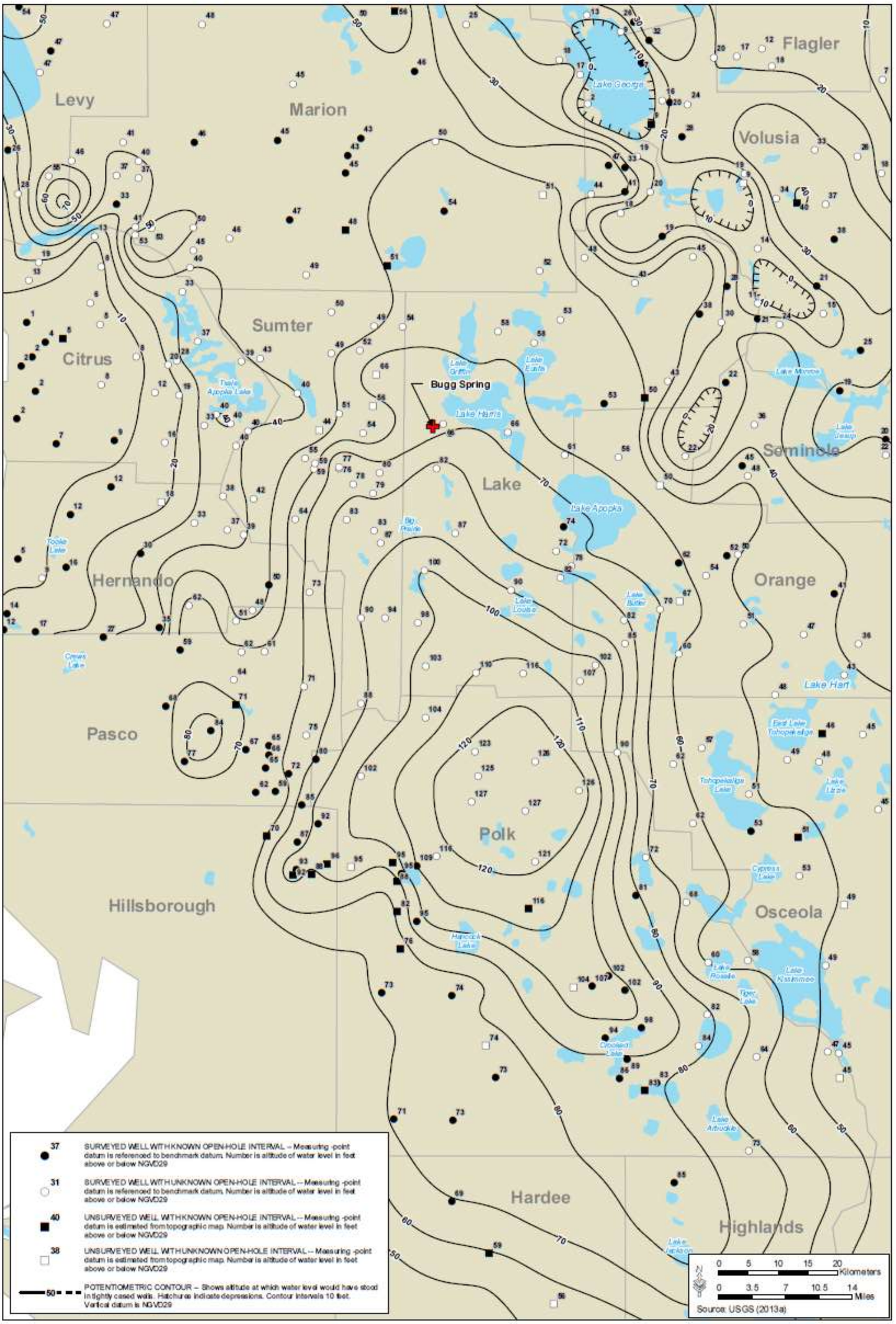

Figure 2-7. Potentiometric Contours

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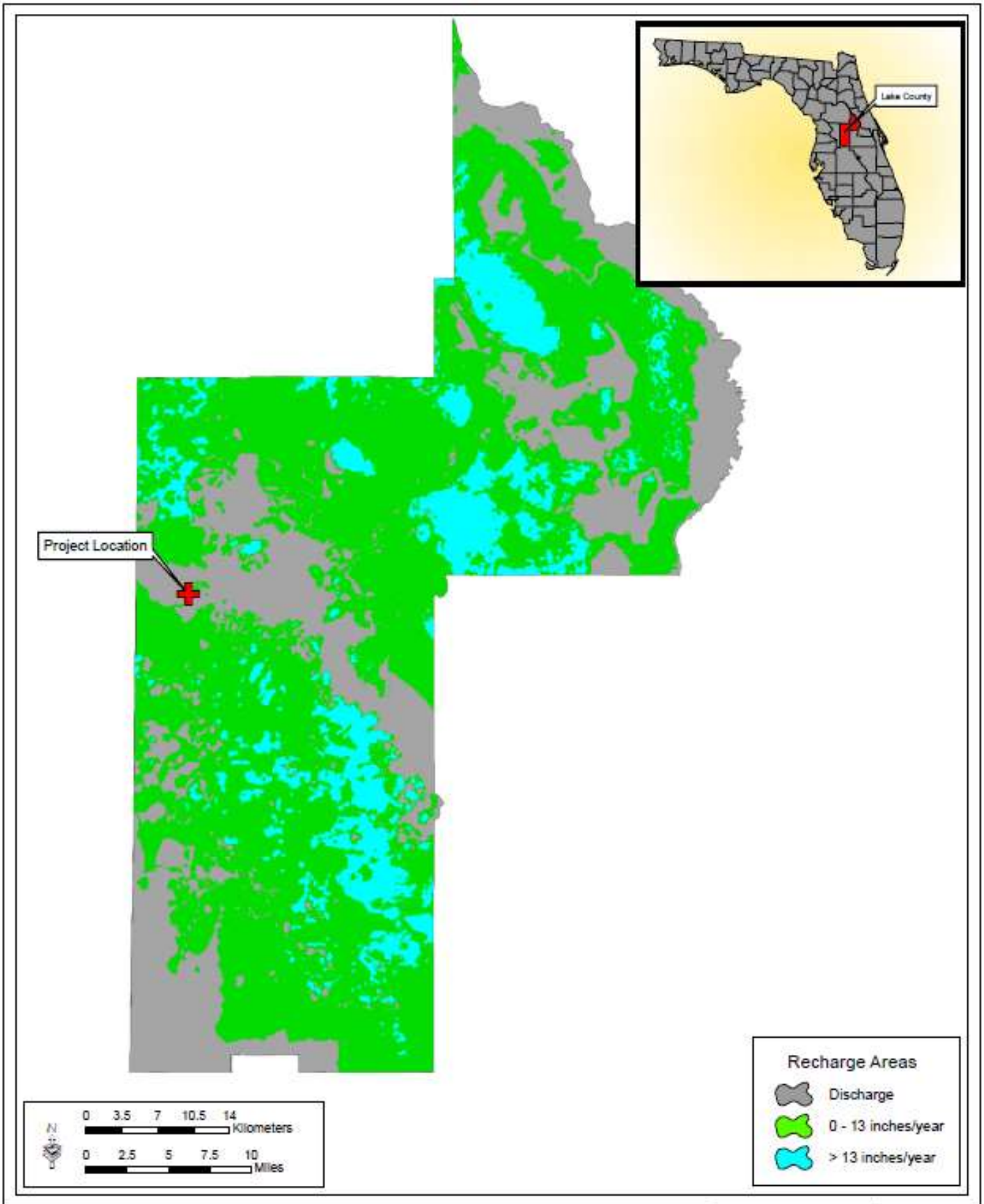

Figure 2-8. Aquifer Recharge Zone

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The Floridan Aquifer is the primary water source for most of the human population in central and northern Florida. Water levels in the aquifer have been declining since 1980 and earlier (Miller 1990). However, since measurements began in the 1940s, flow rates at Bugg Spring have remained relatively stable compared with aquifer levels (Walsh et al. 2009). The flow rate changes at Bugg Spring correlate closely with regional precipitation over recharge areas. Flow rates during the winter have showed declines when additional water was pumped out of the aquifer to protect crops from freeze damage (Walsh et al. 2009).

The most important aspect of the hydrology of Bugg Spring with regards to acoustics is the extremely consistent temperature throughout the lake, averaging 74.5° F from 1967 to 2010, with a minimum temperature of 68.7° and a maximum temperature of 80.42° over that period (St. Johns River Water Management District [SJRWMD] 2012). There is virtually no turbulence from spring flow, and there is no halocline, both of which would interfere with acoustic tests.

Discharge from Bugg Spring was measured by the USGS from 1943 to 1985 and was measured at least monthly by the previous landowner from 1990 to the present. The difference between the maximum and minimum discharge is 16.0 cubic feet per second (cfs), with a mean discharge from 1943 to 2010 of 11.25 cfs (SJRWMD 2012). There is no boil on the water surface from the discharge and no significant current is created. The age of discharge water was interpreted using analysis of carbon isotope ratios to be less than 50 years (SJRWMD 2012, Fontes and Garnier 1979).

Walsh et al. (2009) report exhaustively on the hydrology, water quality, and aquatic communities of Bugg Spring and other springs. They found that over time, nitrate and phosphorous concentrations were relatively constant and slightly higher than background conditions. The water is saturated with respect to calcite and slightly undersaturated with respect to dolomite. The median pH and dissolved solids were 7.6 and 167 milligrams per liter, respectively.

2.2.3 Physiographic Setting

The LEFAC/Bugg Spring facility is located in a karst landscape in the north-central part of peninsular Florida, within the Ocklawaha River watershed. It lies approximately 12 miles north of the Lake Wales Ridge, an elevated ridge formed from a system of ancient sand dunes that extend about 150 miles north-to-south through central Florida. The sinkhole lake sits lower in elevation than the immediate area to the east, south, and west. Water from Bugg Spring flows north about 1.5 miles into the Okahumpka Marsh and Helena Canal, which connects Lake Denham with Lake Harris. This basin is covered by open water, marsh, and dense woodland, and the majority of the LEFAC/Bugg Spring facility is densely wooded. Further west and south of

Bugg Spring, the karst geology is more exposed and erosion has created rolling hills, caves, and sinkholes that allow surface water to percolate down into the aquifer.

2.2.4 Mineral Resources

Florida produces large amounts of limestone that is used for road construction and in the manufacture of Portland and masonry cement. It also produces sand and gravel that are used in construction and industrial applications. Clay is mined in some parts of Florida, as are the heavy minerals ilmentite, rutile, zircon, and leucoxene. Central Florida is a leading producer of phosphate, used to manufacture fertilizer, and peat used for horticulture. There are sand and peat mines in Lake County and limestone mines in nearby Sumter County to the west (FDEP 2012). No mines are known from the LEFAC/Bugg Spring facility, although a peat company mixes, but does not mine, peat at a facility located approximately 1 mile west of the LEFAC/Bugg Spring facility. There is a small pit near the western boundary of the LEFAC/Bugg Spring facility that the previous landowner postulated might have been a source of clay excavated by Native Americans, although no supporting evidence has been found.

2.2.5 Soil Series and Associations

Soils present on the LEFAC/Bugg Spring facility were determined using the Natural Resources Conservation Service (NRCS) Web Soil Survey data for Lake County, Florida (NRCS 2013). The LEFAC/Bugg Spring facility overlies 11 distinct soil types. Each soil type and the acreage represented at the LEFAC/Bugg Spring facility are listed in Table 2-1, described in text below, and shown in Figure 2-9.

Table 2-1. Soil Types and Acreages Present at the LEFAC/Bugg Spring Facility

Soil Type	Total Acreage (Approximate)
Anclote and Myakka soils	17.9
Apopka sand	5.3
Candler sand	0.8
Immokalee sand	10.1
Kendrick sand	1.6
Paola sand	5.7
Placid sand	0.1
Pomello sand	2.8
Pompano sand	1.3
Sparr sand	2.2
Tavares sand	26.6
Water	2.8
Total	**77.2**

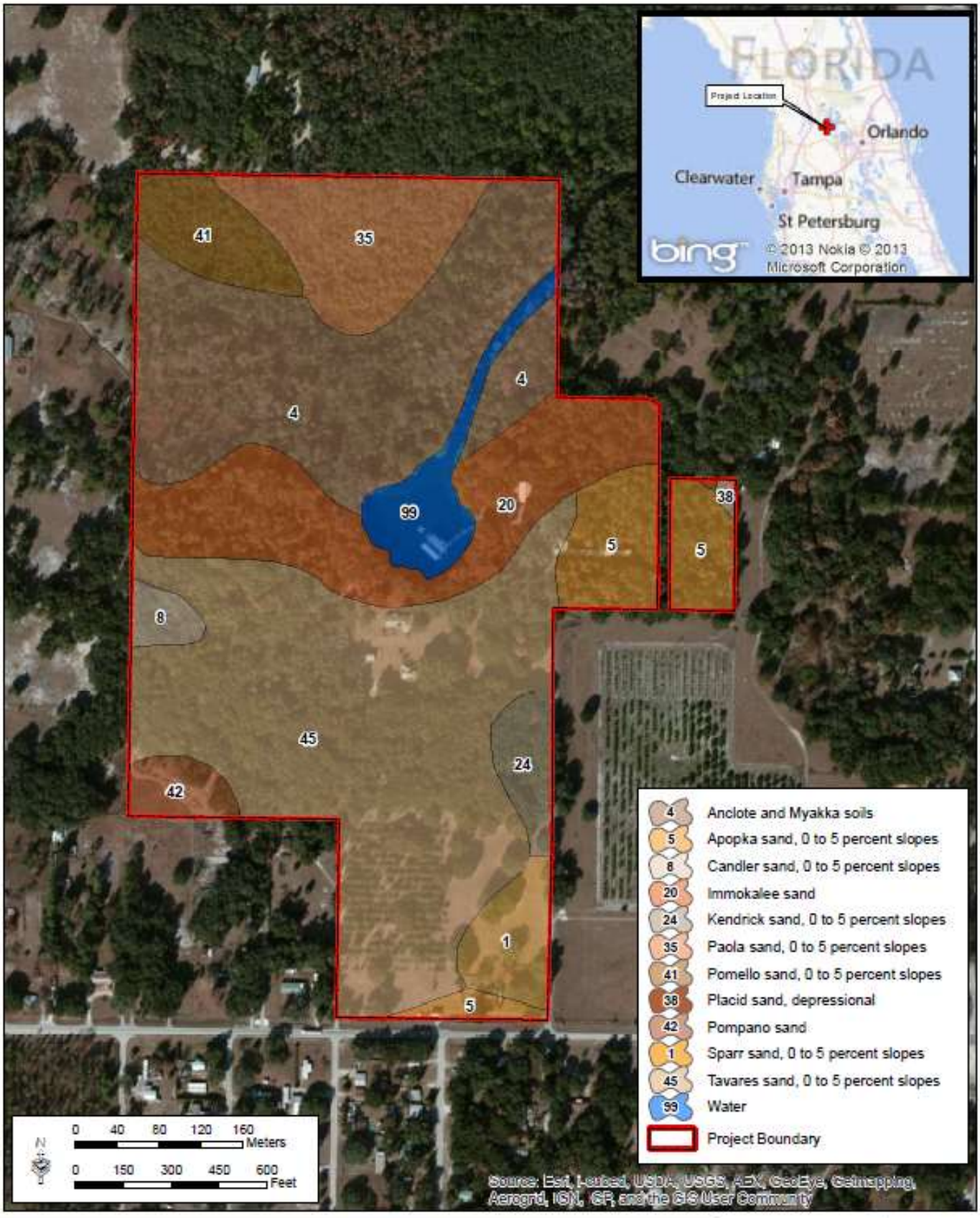

Figure 2-9. LEFAC/Bugg Spring Soils Map

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Anclote and Myakka Soils

Anclote and Myakka soils underlie approximately 23 percent of the LEFAC/Bugg Spring facility and formed in sandy marine deposits. Areas with Anclote soils typically have a slope of 0 to 2 percent. They are found in depression, flats, and poorly defined drainages. They are very poorly drained soils and may experience frequent ponding. They are used predominantly for range or are forested. Areas with Myakka soils typically have slopes ranging from 0 to 8 percent and are very poorly drained to poorly drained. Permeability is rapid in upper horizons and moderate in lower horizons. Most areas of Myakka soils are often covered with flatwoods, although they are occasionally mapped in floodplains and depressions.

Myakka soils are commonly used for forestry or range; however, with adequate water control, they may be used for citrus orchards, pasture, and truck crops. On the LEFAC/Bugg Spring facility, forested wetlands cover much of the area underlain by Anclote and Myakka soils.

Apopka Sand

Apopka series soils are deep, well drained, moderately permeable soils found on ridges and side slopes. They formed in thick beds of sandy and loamy marine deposits. Areas with Apopka sands have slopes ranging from 0 to 5 percent. Large areas of Apopka series soils have been cleared and used for citrus orchards and pasture. On the LEFAC/Bugg Spring facility, Apopka sand underlies abandoned citrus orchards, a residence and its grounds, and upland hardwood forest.

Candler Sand

Candler series soils consist of very deep, excessively drained, rapidly permeable soils formed from marine deposits. They may be strongly to moderately acidic, and found on slopes from 0 to 5 percent. Candler soils are typical of uplands and are commonly used for citrus orchards and pasture. The area of the LEFAC/Bugg Spring facility that is underlain by Candler Sand is covered with upland hardwood forest.

Immokalee Sand

Immokalee series soils are very deep, poorly drained soils on flatwoods and in depressions. They formed from marine sediments and runoff is slow or ponded while permeability is rapid to moderate. Immokalee sands are found on slopes ranging from 0 to 2 percent; however, slopes can range up to 5 percent where the soil is adjacent to swamps, ponds, marshes, and lakes. Much of the area underlain by Immokalee Sand is forested wetlands, with some upland forests.

Kendrick Sand

Kendrick series soils are well drained, slowly to moderately slowly permeable soils formed in thick beds of loamy marine sediments. Kendrick sands can be found on slopes ranging from 0 to 5 percent. Regionally, most of these soils have been cleared for agriculture. In the project area, Kendrick Sand underlies upland forests.

Paola Sand

Paola series soils are very deep, well drained, very rapidly permeable soils typically found on uplands. They are formed from marine deposits and found typically on slopes from 0 to 20 percent, although on the LEFAC/Bugg Spring facility, slopes are 0 to 5 percent. Paola sands are usually forested and can range from very acidic to almost neutral in pH. Scrubby flatwood woodlands grow on areas with Paola sands on the LEFAC/Bugg Spring facility.

Pomello Sand

Pomello series soils are very deep, moderately well to somewhat poorly drained soils that are sandy. They formed in marine sediments, range from strongly to moderately acidic, and have slopes ranging from 0 to 5 percent. Pomello series soils are usually found on ridges within flatwoods and native plant cover is typically scrub oak communities. A wedge-shaped bed of pomello sand extends into the LEFAC/Bugg Spring facility from the northwest corner of the facility. Scrubby flatwood areas of woodland on the LEFAC/Bugg Spring facility grow on Pomello sand.

Placid Sand

Placid series soils are very deep, very poorly drained, rapidly permeable soils typically found on flats, depressions, and poorly defined drainage ways through uplands. Placid soils formed under conditions of fluctuating but very shallow groundwater tables in marine sand. Placid sands are generally found on slopes ranging from 0 to 2 percent. They are rapidly permeable, but that permeability is often impeded by shallow water tables. Placid sand areas are typically used for range and forest. Less than 1 percent of the LEFAC/Bugg Spring facility is on Placid sand and that area supports upland hardwood forests.

Pompano Sand

Pompano series soils are very deep, very poorly drained, and rapidly permeable soils of depressions, drainageways, and flats. They formed in thick beds of marine sands and are typically found on slopes ranging from 0 to 2 percent. They may range from strongly acidic to slightly alkaline and are typically used for range, unless the area has been drained and converted to production of truck crops or citrus fruits. Pompano sands are found in the southwest corner of

the LEFAC/Bugg Spring facility, in a meadow that appears to have been artificially cleared and that extends onto cleared areas of neighboring property.

Sparr Sand

Sparr series soils are very deep, somewhat poorly drained, moderately slowly to slowly permeable soils on uplands of the coastal plain. They formed in thick beds of sandy and loamy marine sediments. Sparr sands are found on slopes ranging from 0 to 5 percent. Most areas of Sparr soils are used for growing crops or as improved pasture. Areas underlain by Sparr sand on the LEFAC/Bugg Spring facility are covered with landscaped grasses and shade trees associated with one of the houses.

Tavares Sand

Tavares series soils are the most common on the LEFAC/Bugg Spring facility and underlie 34 percent of the facility. They consist of very deep, moderately well drained, rapidly or very rapidly permeable soils formed in sandy marine deposits. Cemented substratum phases have slow permeability in the lower stratums. They typically are found on the lower slopes of hills and knolls, with 0 to 5 percent slopes. Most areas of Tavares soils near or on the LEFAC/Bugg Spring facility are now used for citrus orchards.

2.2.6 Topography

The LEFAC/Bugg Spring facility is generally flat and the facility slopes downwards slightly towards the north, with an internal depression centered on the sinkhole that contains the Bugg Spring sinkhole lake. The elevation of the LEFAC/Bugg Spring facility ranges from approximately 61 feet above sea level to about 82 feet above sea level. Much of the facility is in the 100-year floodplain.

2.2.7 Land Use

2.2.7.1 Land Use

The LEFAC/Bugg Spring facility covers approximately 78 acres, and approximately 1.3 percent of it (2 acres) is developed and devoted to Navy use for buildings, storage, and parking. Other land use includes undisturbed forested areas, an abandoned citrus orchard, a cleared meadow, developed residential grounds, open water in the sinkhole lake, and a spring-run stream. The land use types on the LEFAC/Bugg Spring facility are provided in Table 2-2 and Figure 2-10. The developed area, except the access road, is within a security fence, and a 15-foot buffer is maintained between all structures in the developed area and the surrounding vegetation. The boundaries between land use types show fairly distinct vegetation changes, such as an abrupt

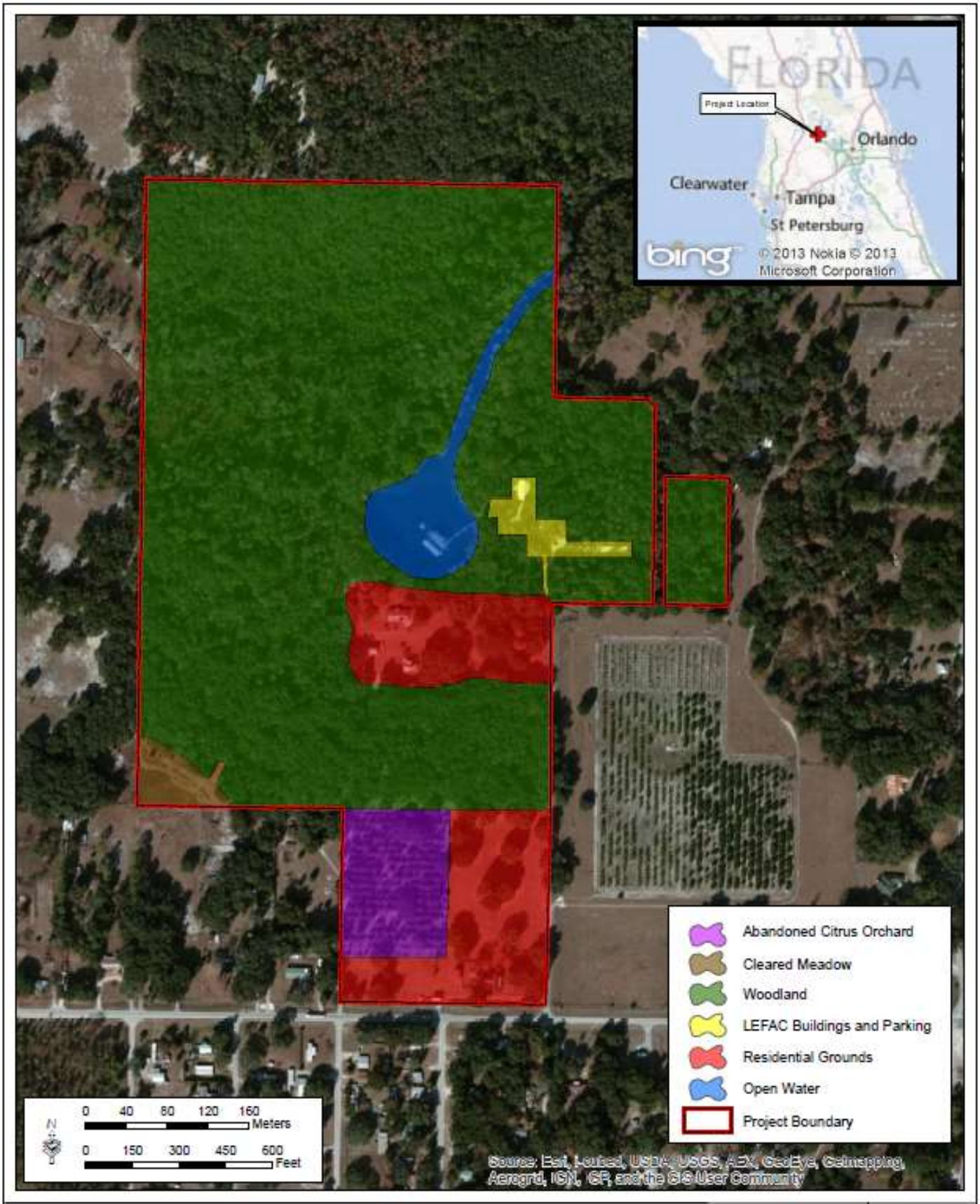

Figure 2-10. Current Land Use

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transition from cleared meadow to mature forest (Photograph 2-2; unless otherwise noted, all photographs were taken by GSRC), or rows of citrus trees at edges of the mowed residential grounds. The residential grounds are not fenced (except for some old and incomplete barbed wire fencing in one location). The spring-run stream channel and sinkhole lake have well-defined banks; however, the transition from forested wetland to upland forest, within the "Woodland" land use type, is more gradual and indistinct.

Photograph 2-2. Habitat Edge

Table 2-2. Inventory of the LEFAC/Bugg Spring Facility Land Use

Land Use	Approximate Area (acres)
Woodland	59
Abandoned Citrus Orchard	4
Cleared Meadow	1
Residential Grounds	9
Sinkhole Lake and Spring-Run	3
LEFAC/Bugg Spring buildings and parking	2
Total	**78**

Little active management of natural resources occurs in the forest or citrus orchard. The cleared meadow and residential grounds are mowed and maintained by the previous landowner. Invasive aquatic vegetation in the sinkhole lake and spring-run stream are periodically treated with herbicide by the SJRWMD. Occasionally a problematic or damaged tree may be removed if it threatens a Navy or residential structure.

2.2.7.2 Woodland

The LEFAC/Bugg Spring facility has an estimated 59 acres (76 percent of the total LEFAC/Bugg Spring facility) of woodland (Photograph 2-3). These areas are not actively used by LEFAC/Bugg Spring personnel, but create a buffer that provides security and privacy as well as dampens ambient noise. These forested areas provide habitat for native and protected species and contribute to natural

Photograph 2-3. Woodland

processes that enhance water quality. The classification and management of the LEFAC/Bugg Spring facility woodlands are described in detail in Section 4.4 (Forestry Management) of this document.

2.2.7.3 Abandoned Citrus Orchard

In the southern portion of the LEFAC/Bugg Spring facility, west of the residential ground, is an abandoned citrus orchard. The citrus trees still produce fruit, but it appears that the field is no longer tended for agriculture. Woody plants are encroaching and colonizing this area. This citrus orchard is likely a remnant of much larger citrus orchards that populated the area in previous decades.

2.2.7.4 Cleared Meadow

There is an approximately 1-acre cleared meadow in the southwestern corner of the LEFAC/Bugg Spring facility. Historic aerial imagery (see Figure 2-2) shows that during previous decades this area was cleared and portions of it may have held standing water. Neighboring properties to this meadow are also cleared; however, it appears that the hardwood forest which predominates that area of the LEFAC/Bugg Spring facility could overgrow the meadow over time. Evidence of mowing was observed in this meadow and the previous landowner might be maintaining its open nature.

2.2.7.5 Sinkhole Lake and Spring-Run

The sinkhole lake is approximately 400 feet across at its widest point and 175 feet deep (SJRWMD 2012). It provides the Navy an unparalleled venue for sonar testing and operation of equipment that requires extremely stable and consistent hydrologic conditions. A dock and floating platform extend from the shore into the middle of the lake and contain structures to move and support heavy equipment (Photograph 2-4). Understory vegetation on some parts of the south shore of the sinkhole lake has been cleared, and a concrete boat ramp, a canoe launch, and a small dock are located along the banks of the lake. Otherwise, the banks are in a natural state, with woody vegetation extending to and overhanging the shoreline. The sinkhole lake drains into a spring-run stream on its northern side (Photograph 2-5).

Photograph 2-4. Sinkhole Lake, Showing Floating Platform in Background

Photograph 2-5. Spring-run Stream Draining Sinkhole Lake

Security fencing crosses the spring-run stream (Photograph 2-6) to prevent boats from accessing the Bugg Spring sinkhole lake and platform used for Navy testing. Recreational boaters or fishermen occasionally travel up the spring-run stream as far as the security fencing. The spring-run stream winds through woodland that eventually gives way to marsh, and after approximately 1.5 miles, connects with the Helena Canal linking Lake Denham and Lake Harris.

Photograph 2-6. Security Fence Crossing Spring-run Stream Channel

2.2.7.6 LEFAC/Bugg Spring Facility Buildings and Parking Area

Bugg Spring Road approaches the LEFAC/Bugg Spring facility buildings from Highway 470 and is the only vehicle access route onto the facility. It terminates in an area adjacent to the Bugg Spring sinkhole lake where an office, a large storage building, several sheds and workshops, and a truck turn-around are located (Photographs 2-7 and 2-8, Figure 2-10). There is currently a security fence protecting these areas, but deliveries by truck must be received at the turn-around between the lake and the office building.

Photograph 2-7. LEFAC/Bugg Spring Office and Security Fence

Photograph 2-8. LEFAC/Bugg Spring Storage Building

2.2.7.7 Residential Grounds

Immediately south of the Bugg Spring sinkhole lake is one parcel that is encumbered by an easement and is landscaped with manicured turf grass and shade trees. It contains two houses and a barn (Photographs 2-9, 2-10, and 2-11). The houses are the long-time residences of the Branham family, who continue to live there. This parcel is approximately 4 acres in size and contains mature oak trees (Photograph 2-12).

Photograph 2-9. Branham Family Residence

Photograph 2-10. House Protected Under Easement

Photograph 2-11. Branham Household Barn

Photograph 2-12. Grounds of Branham Residence

At the southern end of the LEFAC/Bugg Spring facility is another parcel that is encumbered by a life estate (see Figure 1-2). It covers approximately 5 acres and contains a house that is listed on the NRHP (Photograph 2-13), as well as an associated barn and sheds (Photograph 2-14). The remainder of this parcel is covered with manicured grasses and shade trees (Photograph 2-15).

Photograph 2-13. NRHP-Listed House on LEFAC/Bugg Spring Facility

Photograph 2-14. Barn at Southern End of LEFAC/Bugg Spring Facility

Photograph 2-15. Maintained Grounds Near Southern End of LEFAC/Bugg Spring, Facing North

2.3 BIOTIC ENVIRONMENT

The LEFAC/Bugg Spring facility is located in the Central Florida Ridges and Uplands Level IV ecoregion, within the Southern Coastal Plain Level III ecoregion of Florida (Griffith et al. 2012). It is possible that the uplands around Bugg Spring were at one time a fire-adapted pine community, which was once common in the region but is now relatively rare. Aerial imagery (see Figure 2-2) of plant cover from 1941 onward show consistent vegetation types to the west, north, and east of the sinkhole lake. Those areas appear to have been mostly forested during that time. The area south of the sinkhole lake, however, was cleared and in agricultural use by 1941. The cleared areas and orchards extended to the southern banks of the sinkhole lake and reforestation did not occur until after 1974.

One investigation of Bugg Spring concluded that land use in the Bugg Spring region changed little from 1973 to 2004. However, Walsh et al. (2009) did note "some transition of open water/wetlands to forestland as a result of land surface drying and enhanced drainage." There are currently no plans for destruction of native habitats on the LEFAC/Bugg Spring facility, and there are few potential conflicts with migratory birds or RTE species.

Based upon aerial photo interpretation, Florida Natural Areas Inventory (FNAI) data, and site reconnaissance surveys, six major habitat types currently exist on the LEFAC/Bugg Spring facility (FNAI 2010). They are sinkhole lake, spring-run stream, upland hardwood forest, forested wetlands-bottomland forest, pine flatwoods-scrubby flatwoods (see Figure 2-4), and aquatic cave. The aquatic cave habitat is not mapped because its extent and exact location are not known and it lies far beneath the surface.

The definitions and rankings of each community type are drawn from FNAI (2010) and are discussed in the following subsections.

FNAI adopted a ranking system developed by NatureServe and the Natural Heritage Program Network to assign two ranks to each natural community type: a global rank related to worldwide status, and a state rank related to the status in Florida. The ranks are based on many factors, chiefly the number of occurrences, estimated abundance (area), geographic range, estimated number of adequately protected occurrences, relative threat of destruction, and ecological fragility. A summary table of each habitat type found at the LEFAC/Bugg Spring facility and corresponding habitat ranking scores are found in Table 2-3. The FNAI rank definitions are provided in Appendix A. In general, the lower the numeral in the rank, the rarer the habitat type.

Table 2-3. The LEFAC/Bugg Spring Facility Habitat Types and Rankings

FNAI Habitat Type	Global Rank	State Rank
Sinkhole Lake	G2	S2
Spring-run Stream	G2	S2
Upland Hardwood Forest	G5	S3
Forested Wetlands- Bottomland Forest	G4	S3
Pine Flatwoods and Dry Prairie-Scrubby Flatwoods	G2	S2
Aquatic Cave	G3	S3

2.3.1 Sinkhole Lake

FNAI reports the following:

> Sinkhole lakes occur typically in deep, funnel-shaped depressions in a limestone base. Although the depression is relatively permanent, water levels may fluctuate dramatically. These lakes are characterized by clear, alkaline, hard water with high mineral content, including calcium, bicarbonate, and magnesium…They provide habitat for many species also found in accompanying subterranean NCs [Natural Communities]. The vegetation in some sinkhole lakes may be conspicuously absent or limited to a narrow fringe of emergents at the edge of the water…Sinkhole lakes are considered endangered in Florida. They are threatened by erosion which causes destruction of surrounding vegetation and to pollution and other threats to the aquifers with which they are connected (FNAI 2010).

No boil is evident on the surface of the sinkhole lake formed by Bugg Spring, and there is relatively little aquatic vegetation except along the margins in shallow areas. The SJRWMD occasionally treats invasive aquatic plants in the sinkhole lake with herbicide and it is not known what aquatic vegetation would be present in the absence of such control efforts. Woody vegetation extends to the lake banks (Photographs 2-16 and 2-17), except for a few small cleared areas along the southern shore near the previous landowners house. Algae blooms are common, and visibility is much greater at depths below which the algae are not able to photosynthesize. Multiple species of fish have been observed in the spring lake (Appendix B); however, depth and access restrictions prevented Walsh et al. (2009) from sampling fish or macroinvertebrates in the sinkhole lake, and they only report taxa from the associated spring-run stream (Appendix C). Along its northern edge, the sinkhole lake transitions into spring-run stream.

Photograph 2-16. Sinkhole Lake, Facing Northeast

Photograph 2-17. Eastern Shore of Sinkhole Lake

2.3.2 Spring-run Stream

Spring-run streams are “perennial water courses that derive most, if not all, of their water from artesian openings in the underground aquifer. Waters issuing from the aquifer are generally clear, circumneutral to slightly alkaline, and perennial cool. These conditions saturate the water with important minerals, allow light to penetrate deeply, and reduce the limiting effects of environmental fluctuations, all of which are conducive for plant growth. Thus, spring-run streams are among the most productive aquatic habitats” (FNAI 2010).

The spring-run stream from the Bugg Spring sinkhole lake is relatively shallow, less than 2 feet deep in many areas, and flows northward. The northern wall of the sinkhole lake rises steeply, then quickly becomes shallow as the lake transitions into spring-run stream. Emergent aquatic vegetation proliferates in these shallow areas and a large patch of submerged aquatic vegetation grows in the spring-run stream channel (Photograph 2-18). Woody vegetation encroaches and overhangs the banks of the spring-run stream (Photograph 2-19) until it gives way to marsh further downstream, off the LEFAC/Bugg Spring facility.

Photograph 2-18. Vegetation in Spring-run Stream

Photograph 2-19. Spring-run Stream

Walsh et al. (2009) sampled fish and macro-invertebrates in several areas of the spring-run stream. They found 16 species, 12 genera, and 8 families of fishes during the surveys. Approximately 61 percent of the fish specimens captured were poeciliids (*Gambusia holbrooki*) and centrarchids (mostly *Lepomis punctatus*) accounted for 30 percent of the total catch. The fish community in the spring-run stream was “relatively depauperate and overall abundance was low. Qualitative field observations indicated that total fish abundance was greatest in the upstream portion of the spring-run stream and diminished in the lower section” (Walsh et al. 2009). Two specimens of the nonindigenous blue tilapia (*Oreochromis aureus*) were collected in the spring-run stream and that species is common in the sinkhole lake.

Invertebrate surveys detected as many as 39 macroinvertebrate taxa using petite ponar dredge and 58 macroinvertebrate taxa using a dip net. Dip net samples were dominated by amphipods, oligochaetes, and gastropods. The nonindigenous snails *Melanoides tuberculata* and *M. turricula* dominated some dip net samples. The section of Walsh et al. (2009) that presents the data collected from Bugg Spring and discusses methods and survey results in greater detail is attached to this INRMP as Appendix C.

2.3.3 Upland Hardwood Forest

Upland hardwood forest is "well-developed, closed-canopy forest dominated by deciduous hardwood trees on mesic soils in areas sheltered from fire… Upland hardwood forest occurs on rolling mesic hills, slopes above river floodplains, in smaller areas on the sides of sinkholes, and occasionally on rises within floodplains" (FNAI 2010). Aerial imagery of the upland hardwood forest on the LEFAC/Bugg Spring facility (see Figure 2-2) indicates that most of the modern forest has matured since 1974. Those areas were previously cleared for agriculture, predominantly citrus. Before these uplands were cleared, they may have been forested with longleaf pine (*Pinus palustris*) communities; however, that fire-maintained habitat type is now relatively rare in Florida.

The uplands on the LEFAC/Bugg Spring facility show no signs of recent fire and many mature hardwood trees are present with a thick and well-developed understory in most areas (Photograph 2-20). These upland forests transition gradually into forested wetlands to the north. This transition zone contains some wetland and some upland plant species.

Photograph 2-20. Upland Hardwood Forest

2.3.4 Forested Wetlands-Bottomland Forest

According to FNAI, bottomland forest is a type of forested wetland that is

> …deciduous or mixed deciduous/evergreen, closed-canopy forest on terraces and levees within riverine floodplains and in shallow depressions. Found in situations intermediate between swamps (which are flooded most of the time) and uplands, the canopy may be quite diverse with both deciduous and evergreen hydrophytic trees… Bottomland forest, while not as prone to prolonged growing season inundations as alluvial forest, is nevertheless influenced by high water tables and peak seasonal flooding as well as irregular

high flood events… Organic debris from bottomland forests is an important nutrient source for downstream ecosystems (FNAI 2010).

The bottomland forest on the LEFAC/Bugg Spring facility (Photograph 2-21) grows predominantly around the sinkhole lake and in the floodplain. The exact line of transition between the bottomland forest and the upland hardwood forest is indistinct, and the two habitat types share many of the same species.

Photograph 2-21. Bottomland Forest

2.3.5 Pine Flatwoods and Dry Prairie-Scrubby Flatwoods

"Scrubby flatwoods have an open canopy of widely spaced pine trees and a low, shrubby understory dominated by scrub oaks (Q. *ilicifolia*) and saw palmetto (*Serenoa repens*), often interposed with areas of barren white sand" (FNAI 2010). On the LEFAC/Bugg Spring facility, scrubby flatwoods occur in the northwestern corner of the facility. They are densely overgrown with scrub oak and palmetto and are difficult to traverse (Photograph 2-22). They appear to lack openings or areas of barren sand commonly found in other scrub communities. It is likely that periodic fire once maintained openings in this habitat and thinned the understory. Today, fires are often prevented or extinguished, and this habitat type may be reaching a more advanced successional state than it would under a natural fire regime. This scrub community likely extended onto neighboring land to the north and west, but the understory is cleared from those neighboring tracts (Photograph 2-23). The scrubby flatwoods transition to bottomland forest toward the east and south, in proximity to the spring-run stream and sinkhole lake.

Photograph 2-22. Scrubby Flatwoods

Photograph 2-23. Neighboring Tracts of Scrubby Flatwoods with Cleared Understory

2.3.6 Subterranean-Aquatic Cave

Caves in Florida are relatively poorly studied and little-explored compared with other habitat types. FNAI (2010) did not make any updates to the section on subterranean habitats from the 1990 version of the same document. It describes caves as "cavities below the surface of the ground in karst areas of the state. A cave system may contain portions classified as terrestrial caves and portions classified as aquatic caves. The latter vary from shallow pools highly susceptible to disturbance, to more stable, totally submerged systems… The limestone aquifers that underlie the entire state of Florida could be considered vast aquatic cave communities" (FNAI 2010).

The water in aquatic caves may "vary seasonally because of fluvial inputs from interconnected surface streams, or because of detrital pulses and other surface inputs during periods of substantial aquifer recharge. In general, however, aquatic caves are very stable environments with relatively constant physical and chemical characteristics…Subterranean natural communities are extremely fragile, their fauna are adapted to very stable environments and have a limited ability to survive even minor environmental perturbations...Aquatic caves are threatened by pollution of ground and surface waters from agricultural, industrial, and residential sources, as well as by disturbances from divers" (FNAI 2010).

Caves like the one that terminates as Bugg Spring contain portions that are constantly submerged; however, upper reaches of the cave may be permanently or intermittently dry. It is possible that troglobites, species that live in caves permanently throughout their life cycles, may be present in the caves below the LEFAC/Bugg Spring facility. Aquatic troglobites that are typical of Florida caves include cave crayfish (*Cambrus* spp., *Procambarus* spp., *Troglocambarus* spp.), Georgia blind salamanders (*Haideotriton wallacei*), cave amphipods (*Crangonyx* sp.), and cave isopods (*Caecidotea* sp.). Because there is no primary productivity from plants in subterranean systems, troglobites are dependent on nutrient input from the surface. Nutrients in the cave below the LEFAC/Bugg Spring facility come either in water from the recharge zone or from detritus that falls or is carried into the cave from the sinkhole lake. The bottom of the sinkhole lake is described as having a layer of silt and it is not known if the spring orifice is open or if spring water percolates through a layer of sediment on the bottom. An open spring orifice would likely make nutrient input and access much greater for species that inhabit the cave.

It is not known what troglobites or other species inhabit the cave below the LEFAC/Bugg Spring facility, if any. Caves are a habitat type that continues to yield previously described species and many of Florida's listed invertebrates are troglobites (Scott 2004), although no listed troglobites are known from Lake County. One way to determine what fauna exists in caves beneath the

LEFAC/Bugg Spring facility is through subterranean trapping and comparisons with subterranean fauna elsewhere in the region. Baited traps that contain a cone shaped entry, as well as mop heads and other items that provide structure for small invertebrates, have proven successful at trapping troglobites in caves and at spring outflows. If there is a desire to further explore the subterranean fauna at Bugg Spring, it may be possible to lower or place traps at the spring orifice, inside the aquatic cave, if it is accessible, or in local wells and other caves.

2.3.7 Rare, Threatened, and Endangered Species

2.3.7.1 Federally Listed Species

The Endangered Species Act (ESA) was enacted to provide a program for the preservation of endangered and threatened species and to provide protection for the ecosystems upon which these species depend for their survival. All Federal agencies are required to implement management programs for species listed under the ESA and to use their authorities to further the purposes of the ESA. Responsibility for the identification of a threatened or endangered species and development of any potential recovery plan lies with the Secretary of the Interior and the Secretary of Commerce.

USFWS is the primary agency responsible for implementing the ESA, and is responsible primarily for birds and other terrestrial and freshwater species. USFWS's responsibilities under the ESA include (1) identification of threatened and endangered species; (2) identification of critical habitats for listed species; (3) implementation of research on, and recovery efforts for these species; and (4) consultation with other Federal agencies concerning measures to avoid harm to listed species.

An endangered species is a species in danger of extinction throughout all or a significant portion of its range. A threatened species is a species likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Proposed species are those that have been formally submitted to Congress for official listing as threatened or endangered. In addition, USFWS has identified species that are candidates for listing as a result of identified threats to their continued existence, and species may also be petitioned for listing and undergoing review to determine what, if any, listing actions are warranted. The candidate designation includes those species for which USFWS has sufficient information to support proposals to list as endangered or threatened under the ESA; however, proposed rules have not yet been issued because such actions are precluded at present by other listing activity.

USFWS lists 11 species as endangered, eight species as threatened, and three species as candidates for listing in Lake County, Florida (USFWS 2012 and USFWS 2013a). These species

are shown in Table 2-4 along with their Federal and state status, potential to occur at the LEFAC/Bugg Spring facility, and cross references to text and tables that address each species. Table 2-4 also shows which management activities and INRMP projects benefit individual species. For species listed as having no potential to occur at the LEFAC/Bugg Spring facility, no management activities or projects benefit them unless they are connected hydrologically and can be impacted by upstream activities, such as erosion control and stormwater management. Critical habitat has only been designated for one of the species listed in Table 2-4, the West Indian Manatee (*Trichechus manatus*), but that critical habitat does not occur in Lake County.

Animal species in Table 2-4 that have a high potential to occur within the immediate vicinity of the LEFAC/Bugg Spring facility are American alligator (*Alligator mississippiensis*), wood stork (*Mycteria americana)*, Florida scrub-jay (*Aphelocoma coerulescens*), eastern indigo snake (*Drymarchon corias couperi*), sand skink (*Neoseps reynoldsi*), limpkin, Florida sandhill crane (*Grus canadensis pratensis*), eastern diamondback rattlesnake (*Crotalus adamanteus*), American eel (*Anguilla rostrata*), and gopher tortoise. Each of the species in Table 2-4 that could potentially occur on the LEFAC/Bugg Spring facility is described in Section 4.3.2. The American alligator is considered threatened due to similarity of appearance to the American crocodile (*Crocodylus acutus*). Three other RTE species were detected on or adjacent to the LEFAC/Bugg Spring facility; they are limpkin, sandhill crane, and gopher tortoise.

2.3.7.2 Critical Habitat

The ESA requires the conservation of critical habitat, which is defined as the areas of land, water, and air space that an endangered species needs for survival. Critical habitat also includes such things as food and water, breeding sites, cover or shelter, and sufficient habitat area to provide for normal population growth and behavior. Section 7 of the ESA restricts destruction or adverse modification of critical habitat by any activity funded, authorized, or carried out by any Federal agency. One of the primary threats to many species is the destruction or modification of essential habitat by uncontrolled land and water development. Currently, none of the Federally listed species have designated critical habitat within Lake County, Florida (Table 2-4).

2.3.7.3 State-Listed Species

The State of Florida maintains lists of animals that are designated as threatened, endangered, or species of special concern. Florida also includes all species listed as Federally threatened or endangered on the state list. Under Article IV, Section 9 of the Florida Constitution, FWC has authority to "exercise the regulatory and executive powers of the state with respect to wild animal life and fresh water aquatic life, and shall also exercise regulatory and executive powers of the state with respect to marine life..." Whales, manatees, and sea turtles are managed under a

separate statutory authority granted by the Florida legislature. In 2012, Florida introduced management plans that included a Biological Status Review for each of 60 state-listed animal species. RTE species, including state-listed species that may occur on the LEFAC/Bugg Spring facility, are discussed in Section 4.3.2.

The state designates plant species as endangered, threatened, and commercially exploited, and this list is administered and maintained by the Florida Department of Agriculture and Consumer Services via Chapter 5B-40, F.A.C.

FNAI tracks species and habitats in Florida and lists 22 plant species as threatened or endangered and 12 animal species as threatened or of special concern from Lake County (see Table 2-4). These are in addition to federally-listed species. State-listed species with potential to occur at the LEFAC/Bugg Spring facility are the Lake Eustis pupfish (*Cyprinodon variegatus hubbsi*), limpkin, and Florida sandhill crane.

Bugg Spring flows into Lake Denham, which flows into Lake Harris. Lake Harris is known to contain Lake Eustis pupfish; however, it is extremely unlikely that they would occur on the LEFAC/Bugg Spring facility because the shallow, wave-battered shorelines the pupfish requires do not occur on or near the LEFAC/Bugg Spring facility. Limpkins are known to occur on the LEFAC/Bugg Spring facility, and Florida sandhill cranes are common in the area and might occasionally occur on the LEFAC/Bugg Spring facility, although only marginal habitat is available.

2.3.8 Waters of the U.S. and Wetlands

The sinkhole lake at Bugg Spring connects to Lake Harris, which makes it a “water of the U.S.” In addition, potentially jurisdictional wetlands occur on the LEFAC/Bugg Spring facility. These areas are hydrologically influenced by groundwater in the Floridan Aquifer, as well as rain and surface flooding associated with Lake Denham and the Okahumpka Marsh. Projects that impact waters of the U.S. or jurisdictional wetlands require permit review with the local USACE district.

An informal wetland assessment performed during the development of this INRMP mapped approximately 24 acres of wetlands on the LEFAC/Bugg Spring facility (see Figure 2-4) using aerial imagery, soil maps, and field investigations. The wetland transitions from adjacent upland hardwood forest and a gradual shift in the plant community is observable. Plants indicative of hydric soils that were observed include swamp bay (*Persea palustris*), water oak (*Quercus nigra*), baldcypress (*Taxodium distichum*), and Chinese tallow (*Triadica sebifera*) (an invasive species) in the overstory and royal fern (*Osmunda regalis*), cinnamon fern (*Osmunda cinnamomea*), netted chainfern (*Woodwardia areolata*), and palmetto species (*Serenoa* spp.) in the understory.

Table 2-4. Rare, Threatened, and Endangered Species in Lake County, Florida

Species Common Name (in alphabetical order by group)	Scientific Name	Federal Status	State Status	Category	Potential to Occur at LEFAC/ Bugg Spring	Cross-reference to text (Page)	Management Activities that Benefit the Species and its Habitat										INRMP Projects that Benefit the Species and its Habitat				
							Watershed Management and Wetlands	Erosion and Stormwater Control	Floodplain Management	Vegetation Management	Invasive Plant Species Management	Forestry Management	Fish and Wildlife Management	Rare, Threatened, and Endangered Species Management	Migratory Bird Management	Aquatic Species Management	Invasive Plant Treatment and Removal	Rare, Threatened, and Endangered Species Surveys	Bird Surveys	Revegetate Citrus Orchard	Control Invasive Fish Species
FISH																					
American eel	*Anguilla rostrata*	PET		Facultative Catadromous Fish	Y	4-24	M	M	M				M	M		M					
Bluenose shiner	*Pteronotropis welaka*		SSC	Freshwater Fish	Y	4-25	M	M	M				M	M		M					P
Lake Eustis pupfish	*Cyprinodon variegatus hubbsi*		SSC	Freshwater Fish	N	4-26	M	M	M				M	M		M					P
REPTILES AND AMPHIBIANS																					
American alligator	*Alligator mississippiensis*	SAT	SAT	Fresh or Brackish Water, Nests on Land	Y	4-40	M	M	M				M	M		M		P			
Eastern diamondback rattlesnake	*Crotalus adamanteus*	PET		Terrestrial Reptile	Y	4-41				M	M	M	M	M				P			
Eastern indigo snake	*Drymarchon couperi*	T		Terrestrial Reptile	Y	4-29				M		M	M	M				P		P	
Gopher frog	*Rana capito*		SSC	Terrestrial Amphibian, Breeds in Shallow Water	Y	4-47	M			M			M	M				P		P	
Gopher tortoise	*Gopherus polyphemus*	C*	ST	Upland Burrower	Y	4-31				M	M		M	M			P	P		P	
Sand skink	*Plestidon reynoldsi*	T		Terrestrial Reptile	Y	4-44				M	M	M	M	M				P			
Short-tailed snake	*Lampropeltis extenuata*		ST	Terrestrial Reptile	Y	4-45					M			M	M		P	P		P	
Southern hog-nosed snake	*Heterodon simus*	PET		Terrestrial Reptile	Y	4-25				M	M		M	M			P	P		P	
Spotted turtle	*Clemmys guttata*	PET		Wetland Turtle	Y	4-25	M	M	M	M	M		M	M		M	P	P			P
Striped newt	*Notophthalmus perstriatus*	C		Wetland/Upland Amphibian	N	N/A	M	M	M	M	M	M	M	M		M		P			P
BIRDS																					
Everglade snail kite	*Rostrhamus sociabilis plumbeus*	E		Wetland Bird	N	N/A	M	M	M						M						
Florida burrowing owl	*Athene cunicularia floridana*		SSC	Upland Ground-Nesting Bird	N	N/A									M						
Florida sandhill crane	*Grus canadensis pratensis*		ST	Pasture and Wetland Bird	Y	4-45			M	M				M	M	M				P	P
Florida scrub-jay	*Aphleocoma coerulescens*	T		Upland Bird	Y	4-34					M	M		M	M	M			P	P	P
Limpkin	*Aramus guarauna*		SSC	Wetland Bird	Y	4-45	M								M						
Red-cockaded woodpecker	*Picoides borealis*	E		Forest Bird	N	N/A									M						

Table 2-4, continued

Species Common Name (in alphabetical order by group)	Scientific Name	Federal Status	State Status	Category	Potential to Occur at LEFAC/ Bugg Spring	Cross-reference to text (Page)	Management Activities that Benefit the Species and its Habitat										INRMP Projects that Benefit the Species and its Habitat				
							Watershed Management and Wetlands	Erosion and Stormwater Control	Floodplain Management	Vegetation Management	Invasive Plant Species Management	Forestry Management	Fish and Wildlife Management	Rare, Threatened, and Endangered Species Management	Migratory Bird Management	Aquatic Species Management	Invasive Plant Treatment and Removal	Rare, Threatened, and Endangered Species Surveys	Bird Surveys	Revegetate Citrus Orchard	Control Invasive Fish Species
Wood stork	*Mycteria americana*	T		Wetland Bird	Y	4-45	M	M	M			M	M	M	M	M		P	P		P
MAMMALS																					
Florida mouse	*Podomys floridanus*		SSC	Upland Rodent	Y	4-45				M	M		M	M			P	P		P	
Sherman's fox squirrel	*Sciurus niger shermani*		SSC	Upland Rodent	Y	4-45						M	M	M				P			
West Indian manatee	*Trichechus manatus*	E		Coastal Aquatic Mammal	N	N/A	M							M							
INSECTS																					
Monarch butterfly	*Danaus plexippus*	PET		Migratory Butterfly	Y	4-32	M	M	M	M	M			M			P	P		P	
PLANTS																					
Britton's beargrass	*Nolina brittoniana*	E	LE	Upland Plant	Y	4-46		M			M	M		M			P	P			
Carter's warea	*Warea carteri*	E	LE	Inland and Coastal Terrestrial Plant	Y	4-27		M		M				M				P		P	
Celestial lily	*Nemastylis floridana*		LE	Wetlands Plant	Y	4-27		M		M				M			P	P		P	
Chapman's sedge	*Carex chapmanii*		LT	Well Drained Soils Plant	Y	4-28		M	M		M	M		M			P	P			
Clasping warea	*Warea amplexifolia*	E	LE	Annual Herb	N	N/A								M							
Craighead's noddingcaps	*Triphora graigheadii*		LE	Orchid	Y	4-28								M							
Cutthroat grass	*Panicum abscissum*		LE	Grass	N	N/A								M							
Florida bonamia	*Bonamia grandiflora*	T	LE	Perennial Vine	N	N/A								M							
Florida hartwrightia	*Hartwrightia floridana*		T	Perennial Herb	N	N/A								M							
Florida milkvine	*Matelea floridana*		LE	Perennial Vine	N	N/A								M							
Florida mountainmint	*Pycnanthemum floridanum*		LT	Moist Soil Plant	Y	4-49		M	M		M	M		M			P	P			
Florida Pygmy-pipes	*Monotropsis reynoldsiae*		LE	Perennial Herb	Y	4-31		M			M	M		M			P	P			
Florida willow	*Salix floridana*		LE	Moist Soils Plant	Y	4-32		M	M		M	M		M			P	P			
Giant orchid	*Pteroglossaspis ecristata*		LT	Scrub and Sandhill Plant	Y	4-31		M			M	M		M			P	P			

Table 2-4, continued

Species Common Name (in alphabetical order by group)	Scientific Name	Federal Status	State Status	Category	Potential to Occur at LEFAC/ Bugg Spring	Cross-reference to text (Page)	Management Activities that Benefit the Species and its Habitat										INRMP Projects that Benefit the Species and its Habitat				
							Watershed Management and Wetlands	Erosion and Stormwater Control	Floodplain Management	Vegetation Management	Invasive Plant Species Management	Forestry Management	Fish and Wildlife Management	Rare, Threatened, and Endangered Species Management	Migratory Bird Management	Aquatic Species Management	Invasive Plant Treatment and Removal	Rare, Threatened, and Endangered Species Surveys	Bird Surveys	Revegetate Citrus Orchard	Control Invasive Fish Species
Incised agrimony	*Agrimonia incise*		LE	Dry Pine Woodlands Plant	Y	4-49		M			M	M		M			P	P			
Lewton's polygala	*Polygala lewtonii*	E	LE	Perennial Herb	Y	4-39		M			M	M		M			P	P			
Manyflower grasspink	*Calopogon multiflorus*		LE	Perennial Herb	N	N/A								M							
Nodding pinweed	*Lechea cernua*		LT	Perennial Herb	Y	4-49		M			M	M		M			P	P			
Okeechobee gourd	*Cucurbita okeechobeensis spp. okeechobeensis*	E		Vine	N	N/A								M							
Papery Whitlow-wort	*Paronychia chartacea* ssp. *chartacea*	T	LE	Perennial Herb	N	N/A															
Piedmont jointgrass	*Coelorachis tuberculosa*		LT	Perennial Herb	N	N/A								M							
Pigeon wings	*Clitoria fragrans*	T		Perennial Herb	Y	4-42		M			M	M		M			P	P			
Pineland butterfly pea	*Centrosema arenicola*		LE	Perennial Vine	Y	4-43		M			M	M		M			P	P			
Pinkroot	*Spigelia loganioides*		LE	Herbaceous Wet Soils Plant	Y	4-43	M	M	M					M				P			
Pygmy fringetree	*Chionanthus pygmaeus*	E		Shrub/Tree	Y	4-44		M			M	M		M			P	P			
Scrub buckwheat	*Erigonum longifolium var. gnaphalifolium*	T		Perennial Herb	N	N/A								M							
Scrub plum	*Prunus geniculata*	E		Shrub	Y	4-44		M			M	M		M			P	P			
Variable leaf Indian plantain	*Arnoglossum diversifolium*		LT	Herbaceous plant	Y	4-49	M	M	M					M			P				

Y- Yes, N- No
M- The denoted management activity benefits the denoted species and/or its habitat.
P- The denoted project benefits the denoted species and/or its habitat.

Status Key: T- Threatened, E- Endangered, C- Candidate, SSC- Species of Special Concern, ST- State Population Threatened, LE- Plants with State Population endangered, PET- Petitioned for listing, Endangered, LT- Plants with State Population Threatened, SAT- Treated as threatened due to similarity in appearance with a Federally listed species

*- Gopher tortoise population east of Mobile and Tombigbee River, including all of Florida

Source: USFWS 2012, USFWS 2013a, FNAI 2012

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2.3.9 Fauna

A diverse assemblage of wildlife species can occur in Lake County, Florida. The previous landowner was interviewed about wildlife known from the facility, and some species surveys were conducted to support this INRMP. That information was combined with an analysis of habitat types to determine what species could potentially occur on the LEFAC/Bugg Spring facility.

Fish

Fishes common in the region include bluegill (*Lepomis macrochirus*), red-eared sunfish (*L. microlophus*), largemouth bass (*Micropterus salmoides*), white and black crappie (*Pomoxis annularis* and *P. nigromaculatus*, respectively), channel catfish (*Ictalurus punctatus*), mosquito fish (*Gambusia* sp.), various shiners (*Notropis* spp.) and darters (*Etheostoma* spp. and *Percina* spp.), and bowfin (*Amia calva*).

A total of 16 fish species were collected from the spring-run stream below the Navy fence by Walsh et al. (2009), who reported that the fish community was relatively depauperate and overall abundance was low. They were not able to sample in the sinkhole lake however. The majority of the fish sampled (61 percent) were from the family Poeciliidae, mostly eastern mosquitofish (*Gambusia holbrooki*), and centrarchids (30.3 percent), mostly spotted sunfish (*Lepomis punctatus*). Non-native blue tilapia were also caught and are known to be common in the sinkhole lake. During site visits and surveys for this INRMP, biologists saw blue tilapia and gar (family Lepisosteidae), as well as non-native suckermouth catfish (family Loricariidae) in the sinkhole lake.

Amphibians and Reptiles

Reptiles and amphibians are common throughout the area due to the abundance of moist habitats available for nesting and breeding. Common species in the region include Florida cricket frog (*Acris gryllus dorsalis*), green treefrog (*Hyla cinerea*), Florida chorus frog (*Pseudacris nigrita verrucosa*), river frog (*Rana heckscheri*), southern leopard frog (*Rana ulticularia*), southern toad (*Bufo terrestris*), peninsula newt (*Notophthalmus viridescens piaropicola*), green anole (*Anolis carolinensis*), five-lined skink (*Eumeces fasciatus*), cottonmouth (*Agkistrodon piscivorus*), southern black racer (*Coluber constrictor*), Florida green water snake (*Nerodia floridana*), Florida water snake (*Neordia fasciata pictiventris*), Florida redbelly turtle (*Pseudemys rubriventris*), peninsula cooter (*Pseudemys floridana peninsularis*), gopher tortoise, and American alligator.

During surveys and site visits in 2012 and 2013, biologists observed American alligators in the sinkhole lake, an eastern coachwhip (*Masticophis flagellum flagellum*), green treefrogs, and gopher tortoise burrows that showed signs of recent activity.

Mammals

White-tailed deer (*Odocoileus virginianus*), feral hog (*Sus scrofa*), eastern cottontail rabbit (*Sylvilagus floridanus*), gray fox (*Urocyon cinereoargenteus*), red fox (*Vulpes vulpes*), bobcat (*Lynx rufus*), fox squirrel (*Sciurus niger*), eastern gray squirrel (*S. carolinensis*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), eastern spotted skunk (*Spilogale putorius*), opossum (*Didelphis virginiana*), eastern woodrat (*Neotoma floridana*), field mice (*Peromyscus* spp. and *Reithrodontomys* spp.), and various bat species (suborder Microchiroptera) are common in central Florida. Evidence of moles (Family Talpidae) was apparent during surveys in 2013.

Birds

Typical bird species from Lake County, Florida include red-shouldered hawk (*Buteo lineatus*), red-tailed hawk (*B. jamaicensis*), barred owl (*Strix varia*), common yellowthroat (*Geothlypis trichas*), American robin (*Turdus migratorius*), tufted titmouse (*Parus bicolor*), Carolina wren (*Thyrothorus ludovicianus*), American coot (*Fulica americana*), osprey (*Pandion haliaetus*), wood duck (*Aix sponsa*), ring-necked duck (*Aythya collaris*), great egret (*Casemerodius albus*), and pied-billed grebe (*Podilymbus podiceps*), red-winged blackbird (*Agelaius phoeniceus*), common grackle (*Quiscalus quiscula*), common moorhen (*Gallinula galeata*), and northern mockingbird (*Mimus polyglottos*). Appendix B lists bird species detected at the LEFAC/Bugg Spring facility during field surveys.

Other Species

Additional surveys and sampling will produce additional species identified on the LEFAC/Bugg Spring facility. The results of field surveys in 2012 and in 2013 are included in Appendix B. Walsh et al. (2009) conducted surveys of the spring-run stream and noted that Bugg Spring showed relatively high levels of benthic macroinvertebrates as measured by the Shannon-Wiener diversity index (Appendix C). Several tick-borne diseases are reported from Lake County, Florida: Rocky Mountain spotted fever and spotted fever rickettsiosis, and as well as Lyme disease. Rocky Mountain spotted fever and spotted fever rickettsiosis in Florida are transmitted by the American dog tick (*Dermacentor variabilis*) and the brown dog tick (*Thipicephalus sanguineus*). These ticks are primarily found on dogs or other medium sized mammals, which can also host the diseases. Rodents serve as a reservoir for lyme disease, which is also transmitted by the black-legged tick (*Ixodes scapularis*).

2.3.10 Non-native and Invasive species

Invasive animal species observed on the LEFAC/Bugg Spring facility in 2012 and 2013 include blue tilapia (Photograph 2-24), suckermouth catfish (Photograph 2-25), and fire ants (*Solenopsis invicta*) (Photograph 2-26). Other common invasive species that likely occur at the LEFAC/Bugg

Spring facility, at least temporarily, are nutria (*Myocastor coypus*) (Photograph 2-27), pigeons (*Columba livia*) (Photograph 2-28), house sparrows (*Passer domesticus*) (Photograph 2-29), and the house mouse (*Mus musculus*) (Photograph 2-30). Walsh et al. (2009) collected two non-native snails, *Melanoides tuberculata* (Photograph 2-31) and *M. turricula* (Photograph 2-32), during aquatic invertebrate surveys in the spring-run stream. Feral hogs are a common problem in Florida and can cause significant damage; however, no evidence or records of feral hogs on the LEFAC/Bugg Spring facility exist.

Photograph 2-24. Blue Tilapia (Credit USGS)

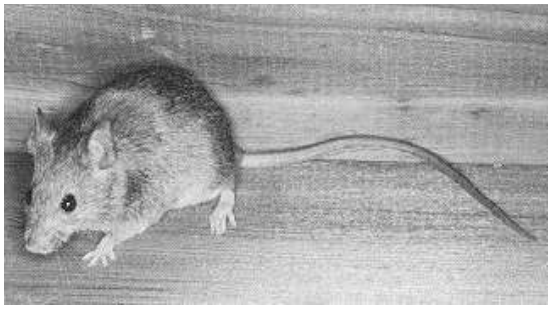
Photograph 2-25. Suckermouth Catfish (Credit FL Fish and Wildlife Conservation Commission)

Photograph 2-26. Fire Ant (Credit USDA)

Photograph 2-27. Nutria (Credit Robert Caputo)

Photograph 2-28. Pigeon (Credit Beth Graham)

Photograph 2-29. House Sparrow (Credit Raymond Belhumeur)



Photograph 2-30. House Mouse
(Credit John L. Tveten)

Photograph 2-31. *Melanoides tuberculata*
(Credit Jean-Pierre Pointier)

Photograph 2-32. *Melanoides turricula*
(Credit Fred G. Thompson)

Winged yam (*Dioscorea alata* L.), an invasive, climbing vine, was identified along the edge of the upland hardwood forest and a neighboring rural residential/agricultural property (Figure 2-11, Photograph 2-33). This is the only location where winged yam was observed, but the patch appears well established and is beginning to grow across the property line. Winged yam creates massive underground tubers, up to 100 pounds, and is capable of vigorous growth that can smother native vegetation.

Photograph 2-33. Invasive Winged Yam Blanketing Native Vegetation

Coral ardisia (*Ardisia crenata*) (Photograph 2-34) plants were found in a swath along the border between upland hardwood forest and wetland. Bamboo (Tribe Bambuseae) (Photograph 2-35) was identified in two locations, and individual camphor trees (*Cinnamomum camphora*) were found in three locations. A few young Chinese tallow trees (Photograph 2-36), up to approximately 6 feet tall, were found growing in a cleared meadow (see Figure 2-11). There are also elephant ear (*Xanthosoma sagittifolium*) (Photograph 2-37), cycads (Order Cycadales) (Photograph 2-38), and other landscaping parts around the manicured property and houses.

Elephant ear and water hyacinth (*Eichhornia crassipes*) (Photograph 2-39) appear sporadically along the perimeter of the sinkhole lake and spring-run stream.

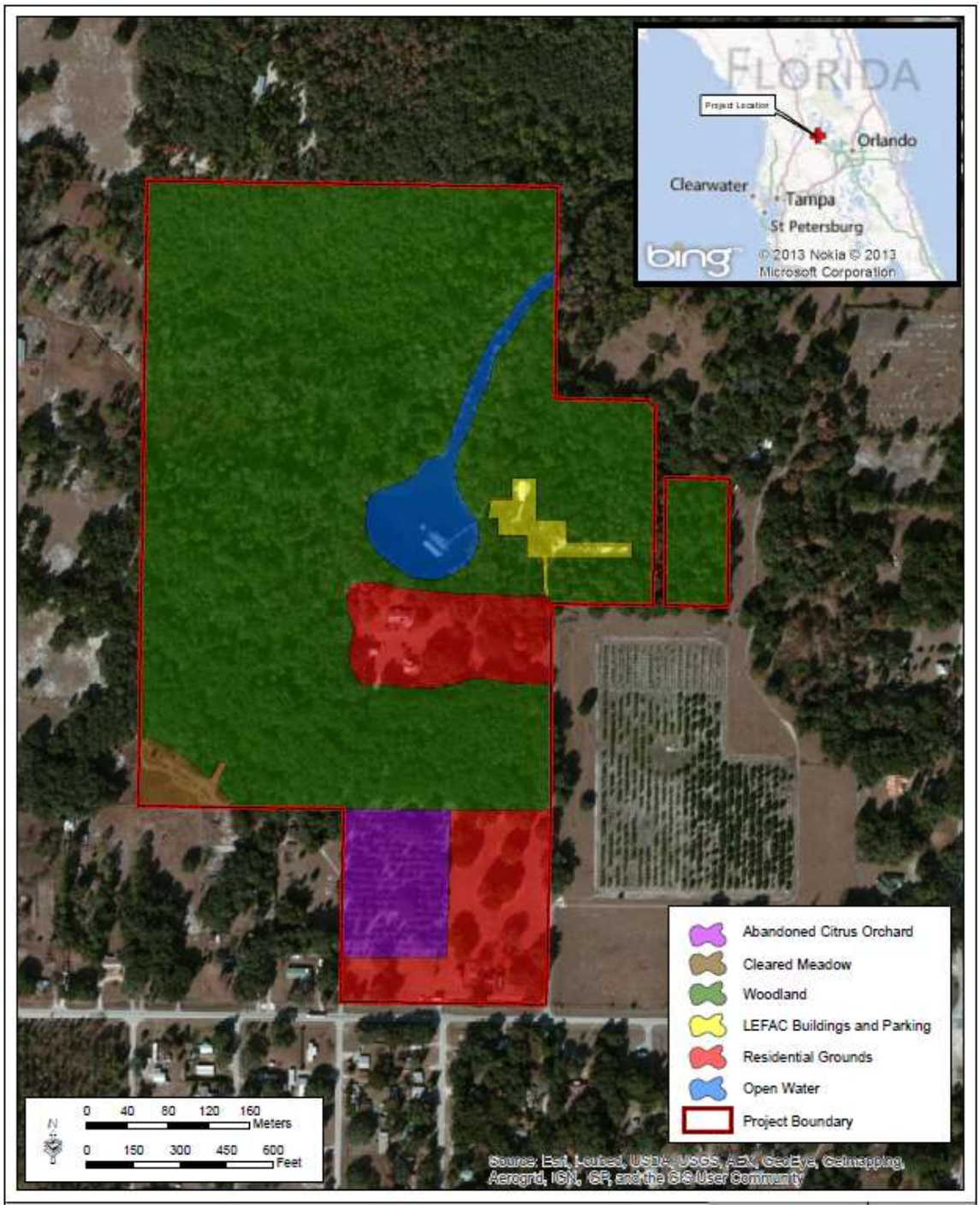


Figure 2-11. Invasive Plant Species Map

Photograph 2-34. Coral Ardisia (Credit Plants for a Future)

Photograph 2-35. Invasive Bamboo Growing by Sinkhole Lake

Photograph 2-36. Chinese Tallow (Credit James Henson)

Photograph 2-37. Elephant Ear (Credit Mark A. Garland)

Photograph 2-38. Cycad sp.
(Credit Tato Grasso)

Photograph 2-39. Water Hyacinth
(Credit R.A. Howard)

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3.0 ENVIRONMENTAL MANAGEMENT STRATEGY AND MISSION SUSTAINABILITY

3.1 SUPPORTING SUSTAINABILITY OF THE MILITARY MISSION AND THE NATURAL ENVIRONMENT

Sustainability is the ability to provide for the needs of the current mission without damaging the ability of future missions to maintain their needs in coordination with natural resources adaptive management. A sustainable process can be carried out over and over without substantial negative environmental impacts, increased operational costs, or a decrease in mission readiness/training.

Activities that are detrimental to the functional values of habitat on the LEFAC/Bugg Spring facility can potentially affect the military mission. For example, deforestation and ground disturbance can increase erosion and particulate material in Bugg Spring and reduced spring flows can cause greater fluctuations in temperature (stable temperatures is extremely important to sensitive sonar testing) and effects on wetlands. Activities that create conditions detrimental to the water quality of the downstream areas or to listed species could result in an enforcement action and they may be ordered discontinued by USFWS or state agencies. Invasive species like hydrilla or water hyacinth have the potential to infest Bugg Spring, foul equipment, and reduce visibility.

Inappropriate herbicide applications (e.g., excessive use or application of inappropriate pesticides) may potentially affect Federally listed and state-listed endangered or threatened species and/or water quality, and consequent regulatory actions by agencies such as USFWS, FDEP, or U.S. Environmental Protection Agency (EPA) could threaten the military mission. Significant pest or disease outbreaks within the LEFAC/Bugg Spring facility forest stands may require restricting access to these areas to limit spreading, which may pose a threat to the continuance of the military mission on the LEFAC/Bugg Spring facility. Nuisance wildlife and/or outbreak of disease on the installation could pose a threat to implementation of the military mission through the infection of military personnel and/or the consequent limitation of access to areas of the LEFAC/Bugg Spring facility to control a problem.

Monitoring and measurement is fundamental to adaptive natural resources management and mission sustainability. The LEFAC/Bugg Spring facility will follow legal mandates and requirements to ensure the effectiveness of the management, plans, controls, and training is monitored. Furthermore, the use of Best Management Practices (BMPs) and established monitoring protocols will enable LEFAC/Bugg Spring facility managers to identify their progress toward achieving goals and objectives. Without effective monitoring and measurement it would

be difficult for the LEFAC/Bugg Spring facility to continually improve, which is the basis of sustainability.

3.1.1 Military Mission and Sustainable Land Use

The LEFAC/Bugg Spring facility is primarily devoted to providing the Navy with a secure location and year-round conditions suitable for calibration of submarine and surface ship tactical towed arrays. There is no Range Complex Management Plan or other operational area plans for the LEFAC/Bugg Spring facility at this time. This INRMP will create a framework for sustainable land use that is compatible with the LEFAC/Bugg Spring facility military mission.

The goals of the LEFAC/Bugg Spring facility include the following:

- Achieve optimal sustained use of Bugg Spring for the execution of sonar testing and calibration
- Implement a management and decision-making process that integrates Navy training and other mission requirements for land use with sound natural and cultural resources management
- Advocate proactive conservation and land and groundwater management
- Align Navy training land management priorities with Navy training, testing, and readiness priorities

3.1.2 Defining Impact on the Military Mission

The military mission at the LEFAC/Bugg Spring facility requires secure access to the naturally existing conditions of Bugg Spring for testing and calibration of equipment. The LEFAC/Bugg Spring facility will comply with environmental regulations and strive to conserve natural resources while also achieving its military mission. During the planning phase of natural resources projects and testing activities resolutions to potential conflicts are established to ensure that environmental regulations (e.g., ESA, Clean Water Act) are being satisfied while improving land and water resources and meeting the military mission.

3.2 NATURAL RESOURCES CONSULTATION REQUIREMENTS

All Federal agencies are required to implement protection programs for designated species and to use their authorities to further the purposes of the ESA. Furthermore, if a Federal action of any kind is found to potentially impact any species protected by the ESA, the responsible Federal agency must enter into Section 7 consultation with USFWS or National Marine Fisheries Service (NMFS). USFWS is the primary agency responsible for implementing the ESA, except for actions involving marine animals or anadromous fish, for which the NMFS is the acting agency. Several

Federally listed species have the potential to occur on LEFAC/Bugg Spring. Section 7 consultation could be required for future military projects that have a potential to impact Federally listed species and/or designated critical habitat.

The CO of NSA Orlando or his agent coordinates with the appropriate regulatory agency on any actions that have the potential to impact RTE species. Early informal consultation with the acting ESA agency is the key to resolving potential problems and addresses issues in a proactive and positive manner and is the preferred method of consultation. Informal consultation includes all discussions and correspondence, and occurs prior to formal consultation to determine whether a proposed Federal action may affect listed species or critical habitat.

NSA Orlando may determine, through the informal consultation process or simply by the nature of the proposed action, that formal consultation is required for an action. If NSA Orlando determines that an activity may have an adverse effect upon a Federally listed species and/or critical habitat, it will enter into formal consultation with USFWS or NMFS to determine whether a proposed action is likely to jeopardize the continued existence of listed species, destroy or adversely modify designated critical habitats, or potentially result in the incidental take of a species. The formal consultation process begins with a written request and submittal of a complete initiation package and concludes with USFWS's or NMFS's issuance of a biological opinion and "incidental take" statement, if applicable.

The Environmental Resource Permit (ERP) Program of FDEP regulates any activities that involve the alteration of surface water flows. An ERP would be required for any construction in uplands that generates runoff or for any dredging and filling in wetlands or surface waters. The permit would be processed and awarded either by FDEP or the SJRWMD and would satisfy requirements of section 401 of the Clean Water Act. Requirements and permit review under section 404 of the Clean Water Act are overseen by USACE. If the LEFAC/Bugg Spring facility seeks to discharge pollutants directly into surface waters, a National Pollutant Discharge Elimination System permit would be required. This is separate from the ERP Program, but the Federal government has authorized FDEP to administer it. Currently there are no anticipated activities that would require either permit.

Migratory birds are specifically protected under the MBTA of 1918, as amended, and EO 13186 of 10 January 2001, Responsibilities of Federal Agencies to Protect Migratory Birds. The MBTA makes it illegal to pursue, hunt, kill, capture, possess, buy, sell, purchase, or barter any migratory bird, including the feathers or other parts, nests, eggs, or migratory bird products, except as allowed by the implementing regulations. EO 13186 requires that Federal agencies avoid or

minimize the impacts of their activities on migratory birds and make efforts to protect birds and their habitat. Military preparedness and readiness activities such as small craft operations training are exempt from the MBTA, but such activities do not occur at the LEFAC/Bugg Spring facility. Even if the exemption did apply, the Navy is still responsible for monitoring the potential impacts on migratory birds from military activities. The MBTA does not expressly address the issuance of permits for incidental take of birds. Rather, the Navy has to exercise due diligence for activities requiring NEPA analysis and develop appropriate and reasonable conservation measures to avoid, minimize, and mitigate identified significant adverse effects to migratory birds and their nests resulting from those activities at the LEFAC/Bugg Spring facility. All migratory bird monitoring will be carried out in conjunction with monitoring and management conducted under EO 13186 as specified in the Memorandum of Understanding (MOU) between DoD and USFWS to Promote the Conservation of Migratory Birds dated 31 July 2006, and in DoD Guidance to implement said memorandum dated 3 April 2007.

3.3 PLANNING FOR NATIONAL ENVIRONMENTAL POLICY ACT COMPLIANCE

NEPA requires an environmental analysis of major Federal actions, including actions that occur with Federal funding or on Federal lands. NEPA requires the evaluation of the environmental effects of proposed land use, development, and military training activities. Some Navy actions fall under an existing categorical exclusion and require no further analysis. For those actions not covered by an existing categorical exclusion, the initial environmental document, the Environmental Assessment (EA), determines the potential for significant project impacts and the feasibility of proposed actions. The NEPA process requires coordination with appropriate Federal and state agencies and the general public. The public review process scopes or identifies significant issues to develop/evaluate alternatives. The preparation of an Environmental Impact Statement (EIS) occurs only if significant impacts are identified. If the EA finds “no significant impacts,” the Navy would complete the preparation of a formal Finding of No Significant Impact and make it available for public review. An EA was prepared before the purchase of the LEFAC/Bugg Spring facility (NAVSEA 2010) and an EA will be prepared by NAVFAC Southeast analyzing the implementation of this INRMP.

3.4 BENEFICIAL PARTNERSHIPS AND COLLABORATIVE RESOURCE PLANNING

Bugg Spring is a unique environment that is directly connected to the aquifer, as well as waters of the U.S., including wetlands. There exists some potential for developing cooperative projects with other agencies, universities, contractors, other installations, local residents, conservation organizations, and the Navy command. Cooperating Federal and state agencies, universities,

and non-governmental organizations (NGOs) can provide a beneficial exchange of technical information, natural resources services, and field assistance.

Examples of such agencies include FWC, SJRWMD, Florida Forest Service, and FDEP, which is the lead state agency for environmental management and stewardship. FDEP can provide assistance with managing wetlands and permitting for stormwater and wetland impacts. Federal agencies that can provide future technical assistance include National Aeronautics and Space Administration, NRCS, U.S. Forest Service, National Park Service, USGS, National Interagency Prescribed Fire Training Center, USACE, and USFWS. In the future, there may be potential to work with NGOs (e.g., The Nature Conservancy), other non-profit entities, and/or universities in a partnership effort to protect and conserve natural resources, maintain environmental compliance, and enhance the Navy's ability to meet its mission critical objectives.

3.5 PUBLIC ACCESS AND OUTREACH

3.5.1 Public Access

Recreational opportunities for the public will likely continue to be limited on the LEFAC/Bugg Spring facility due to security restrictions. Potential recreational opportunities include bird-watching, fishing, hunting, and picnicking; however, confidential equipment and technology is occasionally tested on-site and the property remains the private residence of the previous landowner. Additionally, there is limited parking and a very limited area that is traversable. Most of the facility is wetlands, lacking trails or any sort of boardwalk, and the banks of the Bugg Spring sinkhole lake are almost entirely blocked by vegetation. For these reasons opening the LEFAC/Bugg Spring facility to the public is largely infeasible at this time.

Invasive species management and hydrologic research could potentially benefit from some public access to the LEFAC/Bugg Spring facility. If feral hogs become a problem, the LEFAC/Bugg Spring facility could sponsor permitted hunts for management purposes. Control of hogs would help to maintain natural vegetation and minimize water quality degradation. Participants would be required to have a state hunting permit. Bugg Spring is of some interest to researchers and water resource managers and in the past people have occasionally visited the site to study water quality and quantity that emanates from the spring.

3.5.2 Public Outreach

The LEFAC/Bugg Spring facility currently does not participate in public outreach programs related to natural resources due to the nature of the military mission and security restrictions. The

LEFAC/Bugg Spring facility point of contact can be reached at 352-787-5450 or nuwc_npt_usrd_leesburg@navy.mil.

3.6 ENCROACHMENT PARTNERING

The natural state of the land immediately around Bugg Spring is critical to the qualities that make it a valuable testing and calibration site. The LEFAC/Bugg Spring facility is in a mostly rural area, and the current boundaries generally prevent unobstructed views from outside the facility and provide for vegetation buffers around the spring lake. Navy acquisition of adjacent parcels along the eastern boundaries of the LEFAC/Bugg Spring facility would provide land for additional vegetated buffer to enhance privacy and dampen noise.

The LEFAC/Bugg Spring facility will coordinate with other stakeholders to avoid any conflicting encroachment activity that would jeopardize the military mission, natural resources conditions or values, or the safety of personnel in the area.

3.7 STATE COMPREHENSIVE WILDLIFE PLANS

The U.S. Congress asked each state to develop a comprehensive wildlife conservation plan. Each plan was required to include the species and habitats to be conserved, the conservation actions proposed, procedures to review the plan, and coordination with the public and other agencies. In response, the State of Florida developed its State Wildlife Action Plan (FWC 2012) to conserve wildlife and vital natural areas. That plan was used during the development of this INRMP to identify habitat types and species present on the LEFAC/Bugg Spring facility and ensure that conservation efforts at the LEFAC/Bugg Spring facility were complemented with other conservation and management efforts. The plan will also be used during cooperative management planning with FWC and USFWS.

4.0 PROGRAM ELEMENTS

This section presents the framework of goals, objectives, management strategies, and projects for natural resources at the LEFAC/Bugg Spring facility. Goals, objectives, strategies, and projects are presented for management of land, water, and fish and wildlife species. Goals are general expressions that are compatible with the military mission and provide conservation and ecosystem management targets and direction. Objectives can be defined as defensible targets or specific components of a goal, the achievement of which represents measurable progress toward that goal. Objectives help to focus management activities, and provide a yardstick against which to evaluate and communicate results. Management strategies establish the approach and expected end result for actions that are necessary to accomplish stated objectives. Projects are discrete actions for fulfilling a particular management strategy. Projects may be required to meet regulatory requirements regarding natural resources management, may enhance existing measures to ensure compliance, or may simply provide for sound natural resources stewardship. Projects require labor, resources, and funding, in addition to the day-to-day requirements of the installation.

Management actions are long-term conservation measures that benefit the plants, animals, and ecosystems occurring on the LEFAC/Bugg Spring facility and in the region (Table 4-1). Special attention is given to RTE species and their habitats. Management actions, such as soil conservation, stormwater management, and control of sediment and pollutant runoff, protect water quality and downstream habitats and associated aquatic species.

Table 4-1. Management Actions at the LEFAC/Bugg Spring Facility

Management Actions	Section
Watershed Management and Wetlands	4.1.1
Erosion and Stormwater Control	4.1.2
Floodplain Management	4.1.3
Vegetation Management	4.1.4
Invasive Plant Species Management	4.1.5
Forestry Management	4.2.1
Fish and Wildlife Management	4.3.1
Rare, Threatened, and Endangered Species	4.3.2
Migratory Bird Management	4.3.3
Aquatic Species Management	4.3.4

The Fish and Wildlife Management section of this INRMP (Section 4.3) includes additional goals, objectives, strategies, and projects for the benefit and long-term conservation of RTE species found, or potentially found, on the LEFAC/Bugg Spring facility. Animal and plant species that are indicated as potentially occurring on the LEFAC/Bugg Spring facility (see Table 2-4) are described in Section 4.3.2.4.

4.1 LAND MANAGEMENT

This section focuses on management of the lands and waters on the LEFAC/Bugg Spring facility, including the sinkhole lake and spring-run stream. It addresses watersheds and wetlands, erosion and stormwater control, floodplain protection, vegetation management, and invasive species management. Agricultural outleasing and outdoor recreation are not compatible with the restricted access requirements of the LEFAC/Bugg Spring facility and will not be incorporated into this INRMP.

4.1.1 Watershed Management and Wetlands

Water quality in the Ocklawaha River watershed is addressed by the Upper Ocklawaha Basin Working Group, a partnership with the SJRWMD, Lake County Water Authority, Lake and Orange counties, multiple cities, and other local stakeholders. In 2007, that group released the Upper Ocklawaha Basin Management Action Plan (Action Plan), which sets Total Maximum Daily Load limits for certain pollutants and lists water bodies that do not meet certain standards as "impaired." The Action Plan guides watershed management and provides BMPs to reduce total phosphorus discharges into impaired surface waters. Although the sinkhole lake and spring-run stream associated with Bugg Spring do not show high phosphorus levels, they eventually flow into Lake Harris, which is considered an impaired water body (Upper Ocklawaha Basin Working Group 2007).

Since Lake Harris is a jurisdictional water of the U.S. and is connected to the Bugg Spring sinkhole lake and spring-run stream, both fall under USACE jurisdiction. The sinkhole lake and spring-run are also considered waters of the state and regulated by FDEP. Any infilling or modifications to the spring-run stream channel or flow require coordination and permitting with USACE and FDEP. Water bodies on the LEFAC/Bugg Spring facility also fall within the jurisdiction of the SJRWMD, which oversees the use and protection of water resources in part of Lake County and 17 other hydrologically-connected counties in Florida. The SJRWMD's mission is to provide sufficient water for human use and the natural environment, prevent increases in flooding, protect and improve water quality, and protect and improve natural aquatic systems.

Wetlands on the LEFAC/Bugg Spring facility are considered jurisdictional wetlands and are regulated by USACE under Section 404 of the Clean Water Act. Wetlands also fall under the jurisdiction of FDEP. A preliminary wetlands assessment determined that approximately 24 acres of potentially jurisdictional wetlands occur on the LEFAC/Bugg Spring facility (see Figure 2-4). Wetlands surround most of the sinkhole lake and spring-run stream, and towards the south gradually transition from lower-lying forested wetlands into upland areas. Towards the north, the wetlands connect with a broad marsh. Wetlands are considered in this plan to address land management, water quality, and fish and wildlife management goals.

There are currently no plans to fill or impact wetlands or to alter the morphology or flow of the sinkhole lake and spring-run stream on the LEFAC/Bugg Spring facility. Nonpoint source pollutants enter the sinkhole lake, spring-run stream, and associated wetlands through the Floridan aquifer via the spring outflow and from surface runoff. The wetlands on the LEFAC/Bugg Spring facility help trap sediment and filter pollutants, especially when transmitted via surface flow, as well as reduce water velocity. During rain events, water flows from County Road 470, just south of the LEFAC/Bugg Spring facility, north along Bugg Spring Road and into the sinkhole lake and wetlands. This water carries surface pollutants from the roadway, as well as from neighboring residences and livestock areas. Maintaining and expanding wetlands and a vegetation buffer along the southern bank of the lake will help filter these pollutants and prevent erosion.

No stormwater pollution prevention plan is in place on the LEFAC/Bugg Spring facility nor is one required, because the LEFAC/Bugg Spring facility falls under the North American Industry Classification Code 9711 (National Security). DoD has guidelines for managing its lands that include a goal of no net loss of size, function, and value of wetlands (EO 11990). DoD also has a policy of adopting BMPs for controlling stormwater runoff in the state where a DoD installation is located. BMPs provided in the Action Plan that could be applied to the LEFAC/Bugg Spring facility include infrastructure design to trap stormwater runoff, proper septic tanks design and construction, and development guidelines. These BMPs would predominantly come into practice in the planning and design of any new construction.

The introduction of phosphorous into surface waters is presently the chief concern of the local watershed group and focus of the Action Plan. Phosphorous that enters the waters on the LEFAC/Bugg Spring facility likely comes from a combination of stormwater runoff that carries fertilizers and drains agricultural areas, and septic systems, or is transmitted through the aquifer from sources in the recharge zone.

Stormwater flow is addressed in Section 4.1.2. DoDINST 4715.3 directs installations to use environmentally beneficial landscaping and grounds maintenance practices, including avoiding the use of fertilizers that could contribute phosphorous to the aquatic environment. There is little opportunity for actively reducing phosphorous that arrives at Bugg Spring through the aquifer besides cooperation with any responsible aquifer management efforts.

4.1.1.1 Goals and Objectives

- Achieve a no net loss of wetlands and floodplains and maintain wetland function and habitat quality.
- Ensure compliance of installation actions with Federal, state, and local laws, and DoD policy and instruction.
- Facilitate continued monitoring of spring water quality and quantity.

4.1.1.2 Projects

No projects are planned for wetlands or watershed management. Wetlands on the LEFAC/Bugg Spring facility have been preliminarily mapped and data have been stored in a geographic information system (GIS) database. There are currently no plans to alter or impact wetlands or waterways on the LEFAC/Bugg Spring facility. Existing guidance and BMPs regarding the handling of pollutants and management of Navy lands will help ensure the persistence and function of existing wetlands.

Water quality data was first collected as early as 1967 and has been monitored multiple times each year since 1997 (SJRWMD 2013). This has established a baseline of data to which future pollutant levels can be compared. SJRWMD occasionally visits the facility to treat invasive aquatic plants and measures water quality at Bugg Spring four times per year. The previous landowner has measured the spring discharge at least monthly since 1990 and coordinates with SJRWMD, which posts water quality and quantity data online (SJRWMD 2012). One potential project for future versions of this INRMP is facilitating monitoring to ensure that a continuous set of data is consistently collected over long time periods.

4.1.1.3 Management Strategies

Management strategies to protect the wetlands, waters, and floodplains on the LEFAC/Bugg Spring facility include the following:

1. Identify and map all wetlands, streams, and aquatic habitats and build and maintain a GIS database to store data (this was performed during development of the Draft INRMP, so it is not identified as an official project).
2. Minimize direct and indirect impacts on wetlands, streams, and aquatic habitats while supporting the mission to the extent practicable.

3. Coordinate with USACE Jacksonville District and the SJRWMD regarding activities that could impact wetlands or waterways.
4. Protect water quality of wetlands and streams from nonpoint source and point source pollution, including erosion, bank destabilization, chemical and fuel spills, and sewage disposal.
5. Enhance and maintain protective buffer strips or corridors around wetlands, the sinkhole lake, and along the spring-run stream.
6. Implement BMPs (FDEP 2008, Florida Department of Transportation and FDEP 2007) for water quality management during any new construction and into regular grounds maintenance.
7. Facilitate the continued monitoring of spring water quality and quantity.

4.1.1.4 Additional Sources of Information

SJRWMD
4049 Reid Street
Palatka, FL 32177
386-329-4500
http://floridaswater.com/

USACE – Jacksonville District
Wetlands and Waters of the U.S., Regulatory Division
321-504-3771
http://www.saj.usace.army.mil/Divisions/Regulatory/jurisdict_wetlandID.htm

EPA
Wetlands, Oceans and Watersheds
http://www.epa.gov/owow/

USFWS – National Wetlands Inventory
http://www.fws.gov/nwi/

FDEP
Wetland Evaluation and Delineation Program
http://www.dep.state.fl.us/water/wetlands/index.htm

FDEP, Water Programs
http://www.dep.state.fl.us/water/

University of Florida, Howard T. Odum Center for Wetlands
http://www.cfw.ufl.edu/

Environmental Law Institute
http://www.eli.org/

4.1.2 Erosion and Stormwater Control

Navy policy is that management of soils for sustainment on Navy installations is accomplished by developing and implementing soil erosion and sediment control as a component of the INRMP.

No stormwater pollution prevention plan is required for the installation, and existing operations generally do not cause ground disturbance or contribute significantly to erosion. Soil disturbance is for the most part limited to Bugg Spring Road and the dirt roads leading to the houses and barns. No significant signs of soil erosion were observed. However, it is important to monitor erosion and stormwater flows in order to detect problems. In addition to increasing suspended solids in the sinkhole lake, excessive soil erosion and sedimentation could destabilize banks around the lake and alter water levels and vegetative communities downstream. In turn, this could affect the suitability of the site for Navy activities. Stormwater can also carry fertilizers and nutrients that cause algal blooms in the sinkhole lake that affect visibility.

Any new construction that is proposed in the future should consider soil erosion and stormwater management in the planning and design stages, particularly improvements to Bugg Spring Road and construction of a truck turn-around. The most significant area of concern regarding erosion and stormwater pollution is run-off during high rain events flowing from County Road 470, north along Bugg Spring Road, and into the sinkhole lake.

Future drainage plans should utilize BMPs to minimize impacts, such as paving access roads, incorporating a retention basin or spreading surface flow horizontally across a swale where vegetation and wetlands can intercept sediment and reduce flow rates before the water reaches the banks of the lake or spring-run stream. FDEP has programs addressing nonpoint source, agricultural, surface, and stormwater pollution prevention. They offer BMPs and the Standards and Assessment Section establishes acceptable water quality levels, such as Total Maximum Daily Loads of pollutants.

4.1.2.1 Goals and Objectives

The goal of erosion and stormwater control is to benefit soil productivity, preserve native habitats, and reduce pollutants entering the sinkhole lake and spring-run stream. This will maintain the existing conditions, which benefit the military mission and will protect the aquatic communities on the LEFAC/Bugg Spring facility, as well as downstream in public waterways. Objectives for achieving the goals are as follows:

- Maintain water quality standards commensurate with levels adopted by FDEP and the Action Plan.
- Prevent water flowing off of roadways and roofs from becoming channelized, and stabilize and repair erosive flowpaths.
- Minimize use of pesticides and fertilizers on the LEFAC/Bugg Spring facility.

4.1.2.2 Projects

Erosion and stormwater pollution are not currently significant problems at the LEFAC/Bugg Spring facility and no specific projects are necessary to address them. The established wetlands and vegetation communities help to preserve soils, minimize impacts from erosion, and trap pollutants that would drain into the waterways. A potential future project is restoring the southern banks of the sinkhole lake and reestablishing a broader buffer of vegetation around it.

4.1.2.3 Management Strategies

The Navy will protect the water quality of the sinkhole lake and downstream bodies of water from pollutants introduced by erosion or stormwater flow. This will be accomplished by implementing soil conservation, stormwater, and water quality BMPs (FDEP 2008, Florida Department of Transportation and FDEP 2007) where practicable, and by maintaining natural vegetation on the LEFAC/Bugg Spring facility, especially around the sinkhole lake.

The following strategies will be adopted to achieve management goals:

1. Cooperate with monitoring programs for water quality and quantity.
2. Seek to meet FDEP water quality standards and seek FDEP assistance if water quality monitoring efforts detect levels outside of compliance.
3. Monitor roads for erosion, potholes and damage and repair and stabilize damage to roadbeds or erosive flowpaths.

4.1.2.4 Additional Sources of Information

FDEP Nonpoint Source Management Program
http://www.dep.state.fl.us/water/nonpoint/

FDEP Agricultural Pollution Prevention
http://www.dep.state.fl.us/water/nonpoint/agsrc.htm

FDEP Standards and Assessment Section
http://www.dep.state.fl.us/water/sas/index.htm

FDEP Stormwater Management Programs
http://www.dep.state.fl.us/water/stormwater/index.htm

The National Soil Erosion Research Laboratory
http://www.ars.usda.gov/main/site_main.htm?modecode=36-02-15-00

4.1.3 Floodplain Management

Approximately 25 acres or 32 percent of the LEFAC/Bugg Spring facility is in Federal Emergency Management Agency (FEMA) Flood Zone A, also known as the 100-year floodplain. The

remainder of the facility is in FEMA Flood Zone C, defined as areas with minimal risk of flooding. As such, management of land use and development is regulated by EO 11988, Floodplain Management, which directs Federal agencies to avoid construction in the floodplain, and prescribes management of land use in floodplains to avoid uses that would increase the amount and rate at which flooding occurs or decrease the flood attenuation capacity of the floodplain.

4.1.3.1 Goals and Objectives

Manage land resources to avoid activities that would reduce floodplain capacity or increase flooding rates.

4.1.3.2 Projects

There are no projects directly related to floodplain management, as there are no plans for development in floodplains or activities that may impact flooding.

4.1.3.3 Management Strategies

1. Avoid activities, particularly vegetation clearing and ground disturbance, that would adversely affect flood attenuation.
2. Clear spring-run stream or drainage blockages such as beaver dams, downed trees, etc., that would increase flood levels or prevent flood waters from subsiding.
3. Direct any new construction of buildings or roads out of the floodplain to the extent practicable.

4.1.3.4 Additional Sources of Information

Lake County, Florida, Flood Zone Maps (LEFAC/Bugg Spring is in Map Panel Number 1204210200B)
http://www.lakecountyfl.gov/pdfs/gis/maps/FloodZones_22x34.pdf

Federal Emergency Management Agency (FEMA)
http://www.fema.gov/

4.1.4 Vegetation Management

Forb cover is an important aspect of gopher tortoise habitat that can quickly diminish without regular disturbance that removes woody vegetation. Removing the citrus trees from the abandoned citrus orchard and then periodically removing woody vegetation could benefit gopher tortoise and help combat invasive plant species that are currently present in woodlands on the LEFAC/Bugg Spring facility. Permitting the abandoned orchard to become overgrown with vegetation without any active management might result in the establishment of invasive plant species and displacement of native species and habitats. The regrowth would also eventually create a canopy that discourages the growth of forbs on which gopher tortoise rely. Ensuring that native plant communities replace the abandoned citrus orchard will benefit native species on the

LEFAC/Bugg Spring facility by increasing the amount of native habitats. Other aspects of vegetation management are addressed in other subsections of Land Management (Section 4.1), as well as in Forest Management (Section 4.2). The LEFAC/Bugg Spring facility maintains a 15-foot vegetation buffer around installation buildings and little additional landscaping or grounds maintenance is needed. The two parcels with residential grounds are mowed and maintained by the previous landowners.

4.1.4.1 Goals and Objectives

Remove citrus trees and encourage the establishment of native plant communities to benefit gopher tortoise and other species on the LEFAC/Bugg Spring facility.

4.1.4.2 Projects

Project No. 4 is the removal of citrus trees from the abandoned orchard and mowing that area to encourage robust growth of forbs and prevent encroachment of woody vegetation. The mowed residential grounds are maintained by the previous landowner, who holds an easement that allows mowing and basic landscaping.

4.1.4.3 Management Strategies

1. Remove citrus trees and utilize periodic mechanical disturbance, such as mowing, to prevent encroachment of woody vegetation. Additional mowing may become necessary once the maintained residential grounds are no longer encumbered by easements.

4.1.4.4 Additional Sources of Information

St. Johns River Water Management District
4049 Reid Street
Palatka, FL 32177
386-329-4500
http://floridaswater.com/

U.S. Forest Service
http://www.fs.fed.us/fire/fireuse/rxfire/rx_index.html

Florida Forest Service
http://www.floridaforestservice.com/

USFWS North Florida Ecological Services Office
7915 Baymeadows Way, Suite 200
Jacksonville, FL 32256
http://www.fws.gov/northflorida

4.1.5 Invasive Plant Species Management

The current and foreseeable operations and activities at the LEFAC/Bugg Spring facility are very similar to those that have occurred for the past 50 years, and relatively little active land management is necessary to maintain the natural processes and native habitats on the facility. However, invasive terrestrial plant species have the ability to colonize and change the landscape over time, affecting its value to the Navy and to wildlife. In severe infestations, invasive plants can outcompete native species and form near monocultures. Active and early intervention to resist colonization and kill or remove existing invasive plants is the most effective way to combat this threat and prevent more extreme infestations.

Plant seeds can be carried onto the LEFAC/Bugg Spring facility by wind, water, or animals. Existing patches or locations of invasive plants are limited at this time (see Figure 2-11) and an opportunity exists to remove them before they become so well established and widely spread that they form dense stands and control is much less practicable.

Invasive aquatic plants are a serious problem in Florida waterways. The SJRWMD manages invasive aquatic plant species and occasionally visits the sinkhole lake and spring-run stream on the LEFAC/Bugg Spring facility facility to apply herbicide to invasive aquatic vegetation. Limited invasive aquatic plants were observed during field visits in 2012 and 2013. However, some aquatic plant infestations can become so severe that they choke intake pipes and interfere with machinery and visibility, as well as displace native species and disrupt ecosystems. If, in the future, invasive aquatic vegetation becomes a significant problem on the LEFAC/Bugg Spring facility, treatment or removal efforts that are supplemental to those of the SJRWMD might be necessary.

4.1.5.1 Goals and Objectives

- Prevent the introduction and spread of invasive species.
- Control and minimize infestations of existing invasive terrestrial plant species such as camphor tree, coral ardisia, bamboo, Chinese tallow tree, and winged yam.
- Monitor invasive plant and animal species as needed to inform management decisions and adjust control regimens.
- Maintain, or reestablish where practicable, native ecosystems and habitats.
- Cooperate with regional invasive species management efforts.

4.1.5.2 Projects

Project No. 1: Remove or kill target invasive plant species from the areas indicated in Figure 2-11. Target species include bamboo, coral ardisia, camphor tree, Chinese tallow tree, and winged yam. Removal methods should be selected for proven effectiveness against the target

species and approved for use in natural landscapes. Multiple chemical treatments might be necessary to kill some species, especially the winged yam which can form large tubers and resprout vigorously. Multiple treatment trips might also be necessary to ensure all individuals of any particular species are found and removed and to treat any resprouts or seedlings.

Once the target species have been removed, the effectiveness of removal efforts, as well as the future establishment of invasive plants, should be monitored. Future removal and treatment efforts should be initiated periodically, depending on the colonization and persistence of invasive species on the LEFAC/Bugg Spring facility.

Because the LEFAC/Bugg Spring facility has been the site of homesteads, there are multiple areas with introduced plant species that were used in landscaping. Citrus trees, *Aloe* sp., *Agave* sp., *Philodendron* sp., and other introduced plants have been observed near the houses on the LEFAC/Bugg Spring facility. Although they are not native, these plants are not necessarily invasive, and no special control efforts are necessary at this time.

4.1.5.3 Management Strategies

1. Follow invasive plant species removal methods recommended by State of Florida agencies and the University of Florida Institute of Food and Agricultural Sciences extension program.
2. Select herbicides with low toxicities to fauna and native plants, particularly aquatic systems, and implement invasive plant control efforts that are as species-specific as practicable.
3. Add dye to herbicides to track its spread and minimize exposure to non-target species.
4. Monitor post-treatment and perform follow-up treatments to ensure effectiveness of control efforts.
5. Minimize ground disturbance to better resist colonization of pioneering invasive plant species.
6. Use only native species in plantings and landscaping.

4.1.5.4 Additional Sources of Information

Center for Aquatic and Invasive Plants, University of Florida
http://plants.ifas.ufl.edu/

U.S. Department of Agriculture (USDA) National Invasive Species Information Center
http://www.invasivespeciesinfo.gov/unitedstates/fl.shtml#.UFyGq67AETA

Lake County Invasive Species Management Area
http://www.floridainvasives.org/Lake/

EPA Office of Pesticide Programs
http://www.epa.gov/pesticides/

4.2 FOREST MANAGEMENT

Forest management issues at the LEFAC/Bugg Spring facility are minimal. The LEFAC/Bugg Spring facility is relatively small in size and is not completely forested, with much of the existing forest growing in wetlands (see Figure 2-4). The limited acreage of harvestable trees and the need for vegetation around the sinkhole lake to enhance the military mission make the LEFAC/Bugg Spring facility forests of relatively little commercial value, as such an inventory of timber stands and estimate of potential forestry products on the LEFAC/Bugg Spring facility were not generated.

The existing forest benefits the facility by concealing the Navy facility, dampening sound, stabilizing soils, and providing habitat for native species. Historically, some of the upland areas were likely longleaf pine forest; however, the forest is now in various states of succession that culminates instead in a mature upland hardwood community dominated by oak species (see Figure 2-4).

Although it is a rare habitat known to contain a diverse array of RTE species, restoring the historic longleaf pine forest on the LEFAC/Bugg Spring facility would not directly achieve management goals and is not proposed in this INRMP. The LEFAC/Bugg Spring facility is not contiguous or near existing longleaf pine communities and is relatively small, so it is doubtful that species that are longleaf pine specialists would colonize the LEFAC/Bugg Spring facility and make use of any restored longleaf pine habitat. The cost, necessary disturbance regimen, and disruption of mature oak forest also make restoration of longleaf pine habitat prohibitive. In addition, it would likely require over 70 years to restore a longleaf pine forest.

4.2.1 Forestry Management

Forest management practices complement the goals and objectives of threatened and endangered species preservation (Section 4.3.2), wetland management (Section 4.1.1), fish and wildlife management (Section 4.3), migratory birds (Section 4.3.3), invasive species control (Section 4.1.5), land management (Section 4.1), and wildland fire management (Section 4.2.2). A healthy, well-managed, sustainable forest is the basis for the achievement of the goals for the LEFAC/Bugg Spring facility natural resources. Healthy forests provide better wildlife habitat, improve water quality, limit invasive species establishment and growth, and reduce the probability of stand-replacing fire.

4.2.1.1 Goals and Objectives

- Maintain and/or enhance existing forests.
- Control invasive species within forests and along forest edges.

4.2.1.2 Projects

No forestry projects are recommended at this time. Other measures in this INRMP, such as invasive species control, erosion prevention, and wetlands management will help ensure a healthy forest and the natural processes already at work create a desirable forest condition in the upland and wetland areas. Reducing the density of understory vegetation in scrubby flatwoods can often benefit species like Florida scrub-jay or gopher tortoise. The area of scrubby flatwoods on the LEFAC/Bugg Spring facility is smaller than the 15 to 30 acres that USFWS (1990a) recommends as the minimum preserve size for a single Florida scrub-jay territory, so management of the scrubby flatwoods on the LEFAC/Bugg Spring facility to benefit Florida scrub-jay is not recommended at this time. Gopher tortoise burrows in the scrubby flatwoods appear to be older and likely inactive due to overgrowth. If flatwoods are adjacent to active burrows, restoration work in the flatwoods could improve habitat suitability for gopher tortoise and expand the amount of existing habitat. Management for gopher tortoise could involve mechanical disturbance that reduces understory vegetation and encourages the growth of forbs.

4.2.1.3 Management Strategies

Because the LEFAC/Bugg Spring facility is relatively small (approximately 78 total acres) it does not need to be divided into separate forest management units. The current natural state of the forested wetlands and upland hardwood forest is the desired forest condition, so management largely consists of allowing the natural processes to continue and removing any downed or damaged trees that could pose a safety risk to existing structures. Control of invasive plant species within forests is discussed in Section 4.1.5. Undergrowth in scrubby flatwoods and citrus trees on tracts that might be purchased by the Navy in the future could be removed to encourage growth of gopher tortoise habitat. Project No. 4, which is described in Section 4.1.4.2, involves the removal of citrus trees and maintenance of the abandoned citrus orchard as an open area to benefit gopher tortoise. Without periodic disturbance the abandoned citrus orchard would likely grow into hardwood forest and the shade would reduce the forbs on which gopher tortoise depend for food.

The LEFAC/Bugg Spring facility is in an area that experiences periodic hurricanes, which can destroy large stands of trees. Following such an event, downed trees may need to be removed from roads and around buildings and parking areas, and possibly from the sinkhole lake and spring-run stream. The remainder of the forest will be allowed to revegetate naturally; however, if

large stands of invasive trees become established following a hurricane, mechanical or herbicide treatment may be necessary.

The following forest management strategies have been established.

1. Woody vegetation will be removed within 15 feet of buildings, where it threatens existing structures or roadways, or if trees downed in the sinkhole lake or spring-run stream interfere with military operations.
2. Ensure the conservation, restoration, and/or maintenance of native ecosystem integrity and native biological diversity by preserving forest on the LEFAC/Bugg Spring facility.
3. No logging or timber harvest will occur on LEFAC/Bugg Spring facility; however, damaged, downed, or diseased trees may be removed.
4. Reduce understory vegetation density in scrubby flatwoods to enhance gopher tortoise habitat.

4.2.1.4 Additional Sources of Information

USDA Forest Service Southern Research Station
http://www.srs.fs.usda.gov/

Florida Forest Service
http://www.floridaforestservice.com/

4.2.2 Wildland Fire Management

Although fire can be an extremely useful land management tool in some fire-adapted Florida ecosystems like scrubby flatwoods (see Figure 2-4), the scrubby flatwoods and the LEFAC/Bugg Spring facility may be too small and too close to residences and buildings for any prescribed burning. Burning forested wetlands or upland hardwood forests would not enhance the military mission or natural resources on the LEFAC/Bugg Spring facility. There are no adequate fire breaks separating the adjacent forested wetlands or upland hardwood forests, which are not adapted to fire. Fire breaks could be created in the future if deemed necessary and use of prescribed burning in the scrubby flatwoods should be considered during all future INRMP reviews and updates. Burning the scrubby flatwoods could potentially benefit fire adapted communities and gopher tortoise; however, mechanical disturbance can be used in place of fire to enhance the growth of forbs and improve habitat for gopher tortoise. If in the future fuel loads in forests become excessive, risk of fire can be reduced by removing fuel such as downed wood or litter and by prescribed burning.

4.2.2.1 Goals and Objectives

Support the mission and avoid fires by maintaining a healthy forest and reducing fuel loads if they become excessive.

4.2.2.2 Projects

No fire management projects are proposed at this time.

4.2.2.3 Management Strategies

1. Perform any activities that could start a fire away from vegetation and practice basic forest fire prevention.
2. Avoid creating large brush piles or concentrations of fuel that could accidentally ignite.
3. Remove vegetation within 15 feet of all buildings.

4.2.2.4 Additional Sources of Information

Southern Regional Fire Training Center
http://www.mfc.ms.gov/southern_regional_fire_training_center.htm

U.S. Forest Service
http://www.fs.fed.us/fire/fireuse/rxfire/rx_index.html

Florida Forest Service
http://www.floridaforestservice.com/

4.3 FISH AND WILDLIFE MANAGEMENT

This section addresses the development and implementation of programs and techniques for managing fish and wildlife resources. The fish and wildlife management issues of this INRMP are RTE species, migratory birds, and aquatic species management.

4.3.1 Fish and Wildlife Management

Fish and wildlife conservation and sensitive habitat protection is conducted through ecosystem management approaches. Ecosystem management encompasses four important initiatives: (1) shift toward managing resources on an ecological basis, (2) formation of public agency partnerships, (3) public involvement, and (4) adaptive management. Interagency and multiple landowner cooperation are important because ecosystem processes do not conform to facility boundaries. Additionally, natural characteristics of the land base and habitat use by organisms may extend across landscapes and regions. Examples of landscape concerns would be management of watersheds and migratory animals, such as bats and neo-tropical migratory birds. The LEFAC/Bugg Spring INRMP seeks to implement forest, fish, and wildlife management and wetland conservation that will support conservation on a landscape level.

Managers must identify and analyze geographic and cumulative impacts of land management to minimize undesired disruption of ecosystem processes. Planned biological surveys and habitat

mapping can indicate trends in ecosystem integrity, as well as abundance and diversity of indicator species. Groundwater data collected by SJRWMD can be used by managers to assess the quality and quantity of water emitted from Bugg Spring.

Ecosystem management is closely linked to modern theories of conservation biology; therefore, it involves protection of biological diversity. Biological diversity protection at the LEFAC/Bugg Spring facility includes conservation of native organisms and their habitats at three major levels: genetic diversity, species diversity, and ecosystem diversity. The LEFAC/Bugg Spring facility will sustain and enhance wildlife habitats of flora and fauna consistent with the military mission.

4.3.1.1 Goals and Objectives

- Maintain or enhance biological diversity.
- Manage fish and wildlife using an ecosystem management approach.
- Build interagency relationships with FWC, SJRWMD, and USFWS to cooperatively manage fish and wildlife resources and their habitats.
- Maintain, or reestablish where practicable, native ecosystems.

4.3.1.2 Projects

No project is proposed at this time because RTE species will be surveyed under Project 2, as described in Section 4.3.2.2.

4.3.1.3 Management Strategies

Manage each habitat type for indicator species and overall habitat health using approaches in FWC (2012a) and employing the strategies enumerated below.

1. Conduct presence/absence surveys for RTE species and species identified in the Florida State Wildlife Action Plan (Species surveys were performed in 2013 during the development of this INRMP).
2. Where possible, the LEFAC/Bugg Spring facility will enter into conservation partnerships with Federal, state, and local agencies and NGOs to improve habitat, monitor water quality and quantity, and allow for species-specific research on the installation.
3. Where possible, military activities will be planned in ways to avoid or minimize impacts on protected species or vulnerable habitat areas.
4. Control invasive and non-native floral and faunal species that compete with native species and their habitats.

4.3.1.4 Additional Sources of Information

FNAI
http://www.fnai.org/

FWC
http://myfwc.com/

USFWS North Florida Ecological Services Office
7915 Baymeadows Way, Suite 200
Jacksonville, FL 32256
http://www.fws.gov/northflorida

4.3.2 Rare, Threatened, and Endangered Species

RTE species are known to occur on the LEFAC/Bugg Spring facility and are of regulatory and conservation concern. Protecting RTE species often also serves to protect the habitats and other factors on which they depend. Through this mechanism, RTE management often results in ecosystem management.

4.3.2.1 Goals and Objectives

- Protect and manage for the recovery of RTE species.
- Schedule appropriate surveys for RTE species potentially occurring at LEFAC/Bugg Spring.
- Educate installation personnel regarding sensitive species.
- Build interagency relationships with FWC, USFWS, and other entities, as appropriate, to ensure consistent and appropriate management of RTE species and their habitats.

4.3.2.2 Projects

Project No. 2: Survey the LEFAC/Bugg Spring facility for RTE and protected species and indicator species listed in the Action Plan and listed in Section 2.3.7 of this INRMP.

4.3.2.3 Management Strategies

RTE species that could occur on the LEFAC/Bugg Spring facility are listed in Table 2-4. Information on ecology, natural history, and conservation is included below. If indications that RTE species other than gopher tortoise are found on the LEFAC/Bugg Spring facility, management strategies specific to the species will be added.

1. Note and incorporate into the INRMP the presence of any RTE species detected on the LEFAC/Bugg Spring facility.
2. During surveys, inspect gopher tortoise burrows to determine occupancy and life stage of any gopher tortoise.
3. If site surveys find federally-listed species within the facility boundary, the Navy shall plan and conduct mission and management activities to avoid adverse impacts to these species and their habitats to the maximum possible extent. The Navy shall consult with the USFWS when it determines that such activities will have unavoidable adverse effects on threatened and endangered species and their habitats.

4. Control invasive species that compete with native species and their habitats.
5. Where practicable, implement the BMPs and recommendations of endangered species management or recovery plans like FWC (2012b) and USFWS (1990a).

4.3.2.4 Federal and State-Listed Species

RTE species that could potentially occur on the LEFAC/Bugg Spring facility are presented in Section 2.3.7 and Table 2-4. Below are species descriptions and natural history information drawn from FNAI (2013a). All RTE species could potentially benefit from RTE species surveys, and the descriptions below explain additional ways the INRMP protects RTE species habitats and which INRMP projects benefit a particular RTE species.

American Alligator

Status: Threatened due to similarity of appearance with a listed species (Federal and Florida)

The American alligator (Photograph 4-1) is a large, aquatic reptile that inhabits fresh or brackish water and nests on land. Adult alligators are opportunistic feeders, preying on birds, other reptiles, fish, and mammals (as large as deer). Juveniles tend to eat crayfish, insects, mollusks, small fish, amphibians, and, if possible, small mammals (USFWS 1980). In the mid-1960s, the alligator was near extirpation from hunting and habitat loss contributing to its decline (NatureServe 2013). However, its population has shown a healthy recovery, and it is protected throughout most of the southeastern U.S. range through regulated harvests.

Alligators inhabit the sinkhole lake and spring-run stream on the LEFAC/Bugg Spring facility and are commonly seen near the Navy buildings and floating platform. The INRMP protects American alligator habitat on the LEFAC/Bugg Spring facility through management of factors including watershed and wetlands (Section 4.1.1; i.e., maintaining wetlands, ensuring compliance with environmental laws and DoD policy, monitoring water quality and quantity), erosion and stormwater (Section 4.1.2; i.e., maintaining water quality standards, preventing and reducing erosion, and avoiding the use of pesticides and fertilizers), floodplains (Section 4.1.3; i.e., manage any new development to avoid reducing the capacity of floodplains or increasing flooding rates), fish and wildlife management (Section 4.3.1; i.e., maintaining biological diversity and ecosystems and cooperating with wildlife management agencies), aquatic species

Photograph 4-1. American Alligator

management (Section 4.3.4; i.e., conserve aquatic habitats). The INRMP project that will benefit American alligators is RTE species surveys (Section 4.3.2.2).

American Eel

Status: Petitioned for Listing (Federal)

The American eel is an elongated, snake-like fish that is yellow-brown in color with a pale underbelly (Photograph 4-2). They inhabit waterways with coastal access and are also found in inland ponds and lakes. Spawing is poorly understood but it is believed that they migrate to the Sargasso Sea, a gyre in the Atlantic Ocean, where they spawn in mass and then die. Young that hatch from drifting eggs migrate upstream into freshwater habitats. They are known to live as long as 43 years and grow to 60 inches. American eels are carnivorous opportunistic feeders and will take a wide variety of live animal prey as well as dead organisms.

The American eel is not known to occur on the LEFAC/Bugg Spring facility. Potential habitat for American eels on the LEFAC/Bugg Spring facility and in downstream waterways is protected through management of factors including watershed and wetlands (Section 4.1.1; i.e., maintaining wetlands, ensuring compliance with environmental laws and DoD policy, monitoring water quality and quantity), erosion and stormwater (Section 4.1.2; i.e., maintaining water quality standards, preventing and reducing erosion, avoiding the use of pesticides and fertilizers), floodplains (Section 4.1.3; i.e., manage any new development to avoid reducing the capacity of floodplains or increasing flooding rates), fish and wildlife management (Section 4.3.1; i.e., maintaining biological diversity and ecosystems and cooperating with wildlife management agencies), aquatic species management (Section 4.3.4; i.e., conserve aquatic habitats, avoid introduction and control invasive aquatic species). Controlling invasive blue tilapia and suckermouth catfish (Section 4.3.4.2) is the project in the INRMP that benefits American eels.

Photograph 4-2. American Eel (Credit FWC)

Bluenose Shiner

Status: Species of Special Concern (Florida)

The bluenose shiner (*Pteronotropis welaka*) (Photograph 4-3) range includes Gulf Coast drainages from the Pearl River, in Louisiana and Mississippi, to the Apalachicola River, in Florida and Georgia, as well as the St. Johns River drainage, in Florida (Page and Burr 2011). Its preferred habitat includes deep, slow-moving, coastal creeks and small to medium-sized rivers of varying clarity, silty bottoms, and often heavily choked with brush and vegetation (Lee et al. 1980, Page and Burr 2011). The bluenose shiner has undergone a precipitous decline in the St. Johns

River Drainage since the 1970s. None were found there in the 2004 statewide Imperiled Species Survey Project (Bass et al. 2004), and none were collected in a recent intensive survey of Alexander Springs using multiple sampling techniques (Steve Walsh as cited in FWC 2011). Bluenose shiners were collected from 21 sites in northwestern Florida in the Imperiled Species Survey Project (Bass et al. 2004). Potential habitat for bluenose shiners on the LEFAC/Bugg Spring facility and in downstream waterways is protected through management of factors including watershed and wetlands (Section 4.1.1; i.e., maintaining wetlands, ensuring compliance with environmental laws and DoD policy, monitoring water quality and quantity), erosion and stormwater (Section 4.1.2; i.e., maintaining water quality standards, preventing and reducing erosion, avoiding the use of pesticides and fertilizers), floodplains (Section 4.1.3; i.e., manage any new development to avoid reducing the capacity of floodplains or increasing flooding rates), fish and wildlife management (Section 4.3.1; i.e., maintaining biological diversity and ecosystems and cooperating with wildlife management agencies), aquatic species management (Section 4.3.4; i.e., conserve aquatic habitats, avoid introduction and control invasive aquatic species). Controlling invasive blue tilapia and suckermouth catfish (Section 4.3.4.2) is the project in the INRMP that benefits bluenose shiners.

Photograph 4-3. Bluenose Shiner (Credit FWC)

Britton's Beargrass

Status: Endangered (Federal and Florida)

Britton's beargrass (*Nolina brittoniana*) (Photograph 4-4) is a perennial herb with long, stiff leaves that grow in a grass-like clump rising from a bulbous stem. The flower has stalks that are 3 to 6 feet tall and are topped by a large cluster of small white flowers. Britton's beargrass is endemic to peninsular Florida and grows in scrub, sandhill, scrubby flatwoods, and xeric hammock habitats. Activities in the INRMP that benefit Britton's beargrass potential habitat include erosion and stormwater control (Section 4.1.2, i.e., preservation of soil and prevention of soil erosion), invasive plant species management (Section 4.1.5; i.e., removal and control of invasive plant species from forests on the LEFAC/Bugg Spring facility), and forest management (Section 4.2.1; i.e., maintenance of existing forest and control of invasive species that degrade them). Projects in the INRMP that would

Photograph 4-4. Britton's Beargrass (Credit Bruce F. Hansen)

benefit Britton's beargrass if it occurs on the LEFAC/Bugg Spring facility include invasive plant removal (Section 4.1.5.2) and RTE species surveys (Section 4.3.2.2).

Carter's Warea

Status: Endangered (Federal and State)

Carter's Warea (*Warea carteri*) (Photograph 4-5) is an herb in the mustard family (Brassicaceae) that grows up to 40 inches tall and forms a rounded crown. It has alternate, pale yellow-green leaves with wedge-shaped bases and rounded tips. It can display up to 60 flowers that are about 0.5 inch wide with four petals and six long stamens. Carter's warea grows on sandhill, scrubby flatwoods, inland and coastal scrub in south and central Florida. It appears only after fire and is typically managed through prescribed burning. Carter's warea potential habitat is protected in this INRMP through erosion and stormwater management (Section 4.1.2; i.e., observance of BMPs to reduce erosion in uplands), and vegetation management (Section 4.1.4; i.e., maintain disturbance in upland area where abandoned citrus orchard now occurs). Projects in the INRMP that could benefit Carter's warea if it occurs on the LEFAC/Bugg Spring facility include RTE species surveys (Section 4.3.2.2) and removal of abandoned citrus orchard and subsequent regular mechanical disturbance (4.1.4.2).

Photograph 4-5. Carter's Warea (Credit Jeff Ripple)

Celestial Lily

Status: Endangered (Florida)

Celestial lily (*Nemastylis floridana*) (Photograph 4-6) is a perennial herb typically emerging from a bulb into a single tall stemmed plant or occasionally may branch out into a more robust plant. It appears grass-like with basal leaves sometimes extending more than 2 feet. Flowering occurs in the late afternoon from August through September. The flowers are approximately 1.5 inches across and consist of six dark blue, spreading petals and sepals. The fruit consists of an erect, oval capsule. Celestial lily is endemic to the eastern counties of Florida where it occurs in about 15 managed areas. It is a fire-dependent species and may be locally abundant if habitat is

Photograph 4-6. Celestial Lilly (Credit Alfred R. Schotz)

frequently burned, at least once every 2 to 3 years. Activities in the INRMP that benefit celestial lily potential habitat include erosion and stormwater control (Section 4.1.2, i.e., preservation of soil and prevention of soil erosion), and vegetation management (Section 4.1.4, i.e., removing abandoned citrus orchard and periodically disturbing the area to prevent encroachment of woody species and encourage forb growth). Projects in the INRMP that would benefit celestial lily if it occurs on the LEFAC/Bugg Spring facility include invasive plant removal (Section 4.1.5.2), revegetation of the abandoned citrus orchard (Section 4.1.4.2), and RTE species surveys (Section 4.3.2.2).

Chapman's Sedge

Status: Threatened (Florida)

Chapman's sedge (*Carex chapmanii*) (Photograph 4-7) is a perennial sedge that forms small to large tufts by means of spreading rhizomes. The leaf blades are up to 0.2 inch wide and it is characterized by elongated rhizomes projecting from brownish culm bases. Chapman's sedge grows on well-drained hammock woodlands, sandy hammocks, and floodplains in the southeastern U.S. Activities in the INRMP that benefit Chapman's sedge potential habitat include erosion and stormwater control (Section 4.1.2, i.e., preservation of soil and prevention of soil erosion), floodplain management (Section 4.1.3; i.e., minimize development and impacts on floodplains and clear any blocked drainages to allow floodwaters to subside), invasive plant species management (Section 4.1.5; i.e., removal and control of invasive plant species from forests on the LEFAC/Bugg Spring facility), and forest management (Section 4.2.1; i.e., maintenance of existing forest and control of invasive species that degrade them). Projects in the INRMP that would benefit Chapman's sedge if it occurs on the LEFAC/Bugg Spring facility include invasive plant removal (Section 4.1.5.2) and RTE species surveys (Section 4.3.2.2).

Photograph 4-7. Chapman's Sedge (Credit the University of Tennessee Herbarium)

Craighead's Noddingcaps

Status: Endangered (Florida)

Craighead's noddingcaps (*Triphora craigheadii*) (Photograph 4-8) is an extremely rare orchid endemic to Florida. It usually stands less than 1 inch tall, though some specimens reach 2 to 3 inches in height. It has heart-shaped leaves that are dark green on top and purple underneath, with ruffled edges. The small flowers of Craighead's noddingcaps are green with white lips that

are flecked with purple. Flowers only remain on the plant for one day. Craighead's noddingcaps grows on the forest floor of mesic to xerix oak/pine/juniper hammocks. Activities in the INRMP that benefit Craighead's noddingcaps potential habitat include erosion and stormwater control (Section 4.1.2, i.e., preservation of soil and prevention of soil erosion), invasive plant species management (Section 4.1.5; i.e., removal and control of invasive plant species from forests on the LEFAC/Bugg Spring facility), and forest management (Section 4.2.1; i.e., maintenance of existing forest and control of invasive species that degrade them). Projects in the INRMP that would benefit Craighead's noddingcaps if it occurs on the LEFAC/Bugg Spring facility include invasive plant removal (Section 4.1.5.2) and RTE species surveys (Section 4.3.2.2).

Photograph 4-8. Craighead's Noddingcaps (Credit Prem Subrahmanyam)

Eastern Diamondback Rattlesnake

Status: Petitioned for Listing (Federal)

Eastern diamondback rattlesnakes (Photograph 4-9) have not been detected on the LEFAC/Bugg Spring facility but they are extremely cryptic and it is highly possible that they occur there. They generally inhabit dry pine flatwoods, sandy woodlands, and scrub habitats, often using gopher tortoise burrows. Management for gopher tortoises at the LEFAC/Bugg Spring facility will likely benefit any eastern diamondback rattlesnakes that occur there. This INRMP protects potential habitat for eastern diamondback rattlesnakes through vegetation management (Section 4.1.4; i.e., removing citrus trees and encouraging growth of native forbs), forest management (Section 4.2.1; i.e., maintaining healthy forests), and fish and wildlife management (Section 4.3.1; i.e., maintaining native ecosystems and coordinating with fish and wildlife agencies). INRMP projects that could benefit eastern diamondback rattlesnakes if they are present include RTE species surveys (Section 4.3.2.2) and revegetation of the abandoned citrus orchard (Section 4.1.4.2).

Photograph 4-9. Eastern Diamondback Rattlesnake (Credit FWC)

Eastern Indigo Snake

Status: Threatened (Federal)

The eastern indigo snake is a large, black, non-venomous snake (Photograph 4-10). Dramatic population declines were caused by over-collecting for the pet trade and by inadvertent mortality caused by rattlesnake collectors who gassed gopher tortoise burrows (USFWS 1999). Gopher tortoise burrows provide protection from winter cold and desiccation and appear to be preferred refugia. Where gopher tortoise burrows are unavailable, eastern indigo snakes will use other burrows, hollows at the bases of trees, leaf litter, rock crevices, and trash or wood piles (USFWS 1999).

Where it occurs in xeric habitats, eastern indigo snakes are closely associated with the gopher tortoise. The climate of peninsular Florida is milder than more northern areas, and there eastern indigo snakes can be found in all terrestrial habitats that lack dense urban development. Eastern indigo snakes are especially common in hydric hammocks in central Florida, but also use wetlands and agricultural lands like citrus orchards (USFWS 1999). More information on eastern indigo snake conservation is provided in the recovery plan (USFWS 1982). A diversity of habitats is apparently important for eastern indigo snakes, and studies find that they use many different habitats during various life stages or seasons. Adult males, which range across the broadest areas, are believed to encompass ranges up to 553 acres in summer (USFWS 1999), with an assumed average home range of 185 acres for males and 47 acres for females. Its large territory sizes make eastern indigo snakes vulnerable to habitat destruction and fragmentation. Conservation and recovery depend on large undeveloped expanses of habitat, and the LEFAC/Bugg Spring facility is too small to support a population of eastern indigo snakes, but could form part of an indigo snake territory. Management activities directed at gopher tortoises on the LEFAC/Bugg Spring facility will benefit eastern indigo snakes if they are present and this INRMP protects habitat for eastern indigo snakes through vegetation management (Section 4.1.4; i.e., removing citrus trees and encouraging growth of native forbs), forest management (Section 4.2.1; i.e., maintaining healthy forests), and fish and wildlife management (Section 4.3.1; i.e., maintaining native ecosystems and coordinating with fish and wildlife agencies). INRMP projects that could benefit eastern indigo snakes if they are present include RTE species surveys (Section 4.3.2.2) and revegetation of the abandoned citrus orchard (Section 4.1.4.2)

Photograph 4-10. Eastern Indigo Snake (Credit USFWS)

Florida Mountainmint

Status: Threatened (Florida)

Florida mountainmint (*Pycnanthemum floridanum*) (Photograph 4-11) is an erect, loosely branched perennial shrub that grows up to 4 feet tall. The leaves are about 2 inches long and are aromatic when bruised. Its small, lavender colored flowers are arranged in dense terminal clusters about 1 inch in diameter. Florida mountainmint blooms throughout the summer and grows in wet swales and depression in pine flatwoods, on wet praries, and in floodplain forests. It typically grows on black, sandy peat soils. Activities in the INRMP that benefit Florida mountainmint potential habitat include erosion and stormwater control (Section 4.1.2, i.e., preservation of soil and prevention of soil erosion), floodplain management (Section 4.1.3; i.e., minimize development and impacts on floodplains and clear any blocked drainages to allow floodwaters to subside), invasive plant species control (Section 4.1.5; i.e., removal and control of invasive plant species from forests on the LEFAC/Bugg Spring facility), and forest management (Section 4.2.1; i.e., maintenance of existing forest and control of invasive species that degrade them). Projects in the INRMP that would benefit Florida mountainmint if it occurs on the LEFAC/Bugg Spring facility include invasive plant removal (Section 4.1.5.2) and RTE species surveys (Section 4.3.2.2).

Photograph 4-11. Florida Mountainmint (Credit Steve Christman)

Florida Mouse

Status: Species of Special Concern (Florida)

Adults Florida mice (*Podomys floridanus*) (Photograph 4-12) are brownish or brownish-gray, bright orange-buff on the sides, and white with a tawny patch in the middle of the chest and/or a buffy wash on the abdomen. Juveniles are gray above and whitish below. Average size measurements for adults differ by population; however, on average, an adult would be approximately 7 inches long (nose-to-tail) and weigh approximately 1.5 ounces. Adults have a skunk-like odor (Layne 1992). The Florida mouse is endemic to Florida, inhabits xeric uplands, and is considered a commensal species with gopher tortoise. The Florida mouse constructs its burrow within gopher tortoise burrows. Range-wide population data for the Florida mouse is not available; however, models of suitable habitat suggest that even though a decline has occurred, the species population is secure (FWS 2013). Potential habitat for the Florida mouse on the LEFAC/Bugg Spring facility is the same as the gopher tortoise habitat and would likely coincide

with the locations of gopher tortoise burrows. The INRMP protects potential Florida mouse habitat through vegetation management (Section 4.1.4, i.e. removal of abandoned citrus orchard and revegetation with native species), invasive plant species management (Section 4.1.5, i.e. removal of invasive plants from areas containing gopher tortoise burrows and minimizing introduction of invasive plant species), and fish and wildlife management (Section 4.3.1; i.e. management of wildlife using an ecosystem management approach). Projects that will benefit the Florida mouse and gopher tortoise on the LEFAC/Bugg Spring facility include removal of invasive plant species (Section 4.1.5.2), RTE species surveys (Section 4.3.2.2), and removal of abandoned citrus orchard to encourage forb growth (Section 4.1.4.2).

Photograph 4-12. Florida Mouse (Credit Fiona Sunguist)

Florida Pygmy-pipes

Status: Endangered (Florida)

Florida pygmy-pipes (*Monotropsis reynoldsiae*) (Photograph 4-13) is a rare, perennial herb that occurs in upland mixed hardwood forests, mesic and xeric hammocks, and sand pine and oak scrub habitats. It is parasitic, feeding on underground fungi associated with tree roots. Florida pygmy-pipes attain a height of 1.5 to 5 inches (3.8 to 12.7 centimeters) and are fleshy with scale-like leaves. The purplish-brown peduncles emerge in January and February with spreading flowers appearing as white or lavender pendants situated perpendicularly to the stem. The fruit is a small, dark pink berry. Florida pygmy-pipes is native to central Florida with only six populations currently known to exist. Activities in the INRMP that benefit Florida pygmy-pipes potential habitat include erosion and stormwater control (Section 4.1.2, i.e., preservation of soil and prevention of soil erosion), invasive plant species management (Section 4.1.5; i.e., removal and control of invasive plant species from forests on the LEFAC/Bugg Spring facility), and forest management (Section 4.2.1; i.e., maintenance of existing forest and control of invasive species that degrade them). Projects in the INRMP that would benefit Florida pygmy-pipes if it occurs on the LEFAC/Bugg Spring facility include invasive plant removal (Section 4.1.5.2) and RTE species surveys (Section 4.3.2.2).

Photograph 4-13. Florida Pygmy-pipes (Credit Alfred R. Schotz)

Florida Sandhill Crane

Status: Threatened (Florida)

Florida sandhill cranes are indistinguishable from a more common subspecies, the greater sandhill crane, which also inhabits Florida in the winter but migrates to more northern latitudes to breed. The date of observation of sandhill cranes in Florida is often used to differentiate the two subspecies (FNAI 2013b). Florida sandhill cranes are tall, long-necked and long-legged birds that can stand 3 to 4 feet tall. Their plumage is gray overall, with a white chin, cheek, and throat and dull red skin visible on the crown and lores (Photograph 4-14). Florida sandhill cranes usually avoid forests and deep marshes and are more commonly found in transition zones between these habitats and prairies or pastures. They frequent agricultural feed lots and fields, as well as golf courses and other open areas. They nest in mounds of herbaceous plant material either in shallow water or on the ground in marshy areas. Although Florida sandhill cranes may range widely for food, they are non-migratory. A population estimate performed in 1975 of approximately 4,000 birds is still considered accurate (FNAI 2013b). Alterations to the landscape that degrade or destroy habitat are the chief threats facing the Florida sandhill crane, and nesting success in human-altered landscapes is well below that realized in native habitat (FNAI 2013b).

Florida sandhill cranes were detected during bird surveys on the LEFAC/Bugg Spring facility; however, those birds were not on the LEFAC/Bugg Spring facility and were observed on agricultural land immediately northwest of the LEFAC/Bugg Spring facility. Florida sandhill cranes were also seen in other areas near the LEFAC/Bugg Spring facility, and it is possible that some individuals occasionally use the LEFAC/Bugg Spring facility. The most likely areas for sandhill crane on the LEFAC/Bugg Spring facility are the open residential grounds or abandoned citrus orchard. This INRMP protects potential Florida sandhill crane habitat through management of factors including floodplain management (Section 4.1.3, i.e., avoiding impacts on floodplains adjacent to the LEFAC/Bugg Spring facility where Florida sandhill cranes were sighted), vegetation management (Section 4.1.4, i.e., removal of the abandoned citrus orchard and maintenance as an open area vegetated with native species), fish and wildlife management (Section 4.3.1.1, i.e., maintenance and enhancement of biological diversity and native ecosystems through ecosystem

Photograph 4-14. Florida Sandhill Crane

management as well as cooperating with wildlife management agencies), migratory birds (Section 4.3.3, i.e., bird surveys and maintenance of bird habitat and native ecosystems). Specific INRMP projects that will likely benefit Florida sandhill cranes are bird surveys (Section 4.3.3.2) and conversion of the abandoned citrus orchard to native, open habitat (Section 4.1.4.2).

Florida Scrub-jay

Status: Threatened (Federal)

Florida scrub-jays are medium sized birds with a pale blue head, nape, wings, and tail and pale grey back and underside (Photograph 4-15). Florida scrub-jays inhabit scrub and scrubby flatwoods on excessively well-drained soils. Their habitat is typically dominated by a layer of evergreen oaks, rusty lyonia (*Lyonia ferruginea*), and Florida rosemary (*Ceratiola ericoides*) that is usually less than 6 feet high due to disturbance from fire. Ground cover is typically sparse, dominated by saw palmetto (*Serenoa repens*) and sand palmetto (*Sabal etonia*). Bare patches of sand are essential for caching acorns, and mature pine trees are usually widely scattered across habitat (USFWS 2013c).

The estimated population of the Florida scrub-jay is between 7,000 and 11,000 individuals (USFWS 2013c). Their habitat has been significantly reduced by development and now often occurs only in small, scattered patches. A more detailed account of the natural history of the Florida scrub-jay and the threats it faces is available in the recovery plan (USFWS 1990a). The scrubby flatwoods in the northwest corner of the LEFAC/Bugg Spring facility is marginally potential habitat for scrub-jays; however, none were detected during bird surveys in April or July 2013. This habitat patch on the LEFAC/Bugg Spring facility is unlikely to contain scrub-jays because it is isolated from other scrub-jay populations or other significant habitat patches and because it lacks the open, bare areas typically used by scrub-jays. Without regular disturbance by fire or mechanical means that maintains an open and scrubby vegetation structure, multiple parcels that can be maintained at different successional states, and nearby scrub-jay populations to colonize the LEFAC/Bugg Spring facility, it is doubtful that scrub-jays will nest on the LEFAC/Bugg Spring facility. However, scrub-jays might temporarily occupy the scrubby flatwoods on the LEFAC/Bugg Spring facility as they disperse to other areas. This INRMP protects potential habitat for scrub-jays through activities that include vegetation management (Section 4.1.4; i.e., removal of abandoned citrus orchard and maintenance

Photograph 4-15. Florida Scrub-jay (credit USFWS)

of open area with native plant community), invasive plant species management (Section 4.1.5; i.e., preventing the introduction and spread of invasive plants and controlling invasive plant infestations on the LEFAC/Bugg Spring facility to maintain native ecosystems), forestry management (Section 4.2.1; i.e., maintaining and enhancing forests on the LEFAC/Bugg Spring facility and controlling invasive species), fish and wildlife management (Section 4.3.1; i.e., maintaining biological diversity and native ecosystems as well as cooperating with agencies that manage wildlife resources), and migratory bird management (Section 4.3.3; conducting bird surveys and preventing loss of upland habitat). Projects in the INRMP that could benefit scrub-jays if they were present include removal and revegetation of the abandoned citrus orchard (Section 4.1.4.2), RTE species surveys (Section 4.3.2.2), and bird surveys (Section 4.3.3.2).

Florida Willow

Status: Endangered (Florida)

Florida willow (*Salix floridana*) (Photograph 4-16) is a tree or shrub that grows up to 12 feet tall, with gray bark and brittle, reddish-brown twigs. Its leaves are 2 to 6 inches long, alternate, and are lance-shaped. The upper surface of leaves is bright green while the lower surface is grayish-white with hairy, brown veins. Florida willow grows near springheads, edges of spring-runs, on hydric hammocks, and in floodplains. Activities in the INRMP that benefit Florida willow potential habitat include erosion and stormwater control (Section 4.1.2, i.e., preservation of soil and prevention of soil erosion), floodplain management (Section 4.1.3; i.e., minimize development and impacts on floodplains and clear any blocked drainages to allow floodwaters to subside), invasive plant species control (Section 4.1.5; i.e., removal and control of invasive plant species from forests on the LEFAC/Bugg Spring facility), and forest management (Section 4.2.1; i.e., maintenance of existing forest and control of invasive species that degrade them). Projects in the INRMP that would benefit Florida willow if it occurs on the LEFAC/Bugg Spring facility include invasive plant removal (Section 4.1.5.2) and RTE species surveys (Section 4.3.2.2).

Photograph 4-16. Florida Willow (Credit Gil Nelson)

Giant Orchid

Status: Threatened (Florida)

Giant orchid (*Pteroglossaspis ecristata*) (Photograph 4-17) is a perennial herb with two to four basal leaves that grow up to 28 inches long and 1.5 inches wide. Leaves are erect and pleated, with three to five strong veins. The flower stalk is 1 to 5.5 feet tall and is leafless except for a few bracts. It is topped with a terminal spike of 5 to 30 flowers. Flowers are twisted inwards towards the stalk and have a stiff floral bract beneath each flower. Giant orchid grows on sandhill, scrub, pine flatwoods, and pine rocklands habitats in the southeastern U.S., as well as Cuba. Activities in the INRMP that benefit giant orchid potential habitat include erosion and stormwater control (Section 4.1.2, i.e., preservation of soil and prevention of soil erosion), invasive plant species management (Section 4.1.5; i.e., removal and control of invasive plant species from forests on the LEFAC/Bugg Spring facility), and forest management (Section 4.2.1; i.e., maintenance of existing forest and control of invasive species that degrade them). Projects in the INRMP that would benefit giant orchid if it occurs on the LEFAC/Bugg Spring facility include invasive plant removal (Section 4.1.5.2) and RTE species surveys (Section 4.3.2.2).

Photograph 4-17. Giant Orchid (Credit Dan Hipes)

Gopher Frog

Status: Species of Special Concern (Florida)

The gopher frog (*Rana capito*) (Photograph 4-18) is a short-limbed frog with a large head and ridges along its back. Adults are generally 2 to 3.5 inches long from snout-to-vent (Conant and Collins 1991). The skin ranges in texture from smooth to warty, and from creamy-white to gray or brown in color. The back and sides are dotted with dark brown or black spots and blotches of various sizes and shapes. The gopher frog's call is a loud "snore" that can last for up to 2 seconds (NatureServe 2013). Gopher frogs inhabit native, xeric upland habitats, such as longleaf pine-turkey oak sandhill associations, xeric to mesic longleaf pine flatwoods, sand pine scrub, xeric oak hammocks, and rudereal successional stages of these habitats. They require wetlands for breeding and are absent from otherwise suitable habitat that lacks proximity to wetlands. Generally, the gopher

Photograph 4-18. Gopher Frog (Credit USGS)

frog occurs in gopher tortoise habitat, but the frogs are rare or absent at most active tortoise colonies (Godley 1992). Gopher tortoise or rodent burrows are used for shelter (Gentry and Smith 1968, Lee 1968, Franz 1986), but the gopher frog can also hide under logs, under or in stumps, and in sewers (Wright and Wright 1949). Gopher frogs are threatened by loss and degradation of habitat by silvicultural practices and fire suppression, combined with reduced gopher tortoise populations (NatureServe 2013). The INRMP protects potential gopher frog habitat through management of factors including watershed and wetlands (Section 4.1.1; i.e., protection of wetlands where gopher frogs might breed in shallow pools), vegetation (Section 4.1.4; i.e., revegetation of abandoned citrus orchard with native species), forests (Section 4.2.1; i.e., maintenance of forests), fish and wildlife management (Section 4.3.1; i.e., maintenance of biological diversity, ecosystem management, and cooperation with wildlife management agencies). Projects in the INRMP that could benefit gopher frogs if they occur on the LEFAC/Bugg Spring facility include RTE species surveys (Section 4.3.2.2) and revegetation of abandoned citrus orchard (Section 4.1.4.2).

Gopher Tortoise

Status: Candidate (Federal), Threated (Florida)

Gopher tortoises are approximately 9 to 11 inches long with stumpy, elephantine hind feet and flat forelimbs that are adapted for digging in sand. They are protected by an oblong tan, brown, or gray shell (Photograph 4-19) (FWC 2012b). They typically inhabit uplands with well-drained, sandy soils and are often associated with longleaf pine and scrub oak sandhills, but can also be found in a variety of habitats as long as the soil is able to be excavated into burrows. Burrows average 14.8 feet in length and 6.6 feet in depth (FWC 2012b) and offer protection from cold and predators. Gopher tortoise burrows also serve as refugia for a wide array of other species, including commensal species like the gopher frog (*Lithobates capito*) and the eastern indigo snake (FWC 2012b). A gopher tortoise and multiple burrows were identified during RTE species surveys on the LEFAC/Bugg Spring facility in 2013 (see Figure 2-3). The scrubby flatwoods, in the northern portion of the LEFAC/Bugg Spring facility, contain a few burrows, but this area is of questionable habitat value because it is completely overgrown and lacks sufficient forb cover. The burrows to the north of the Bugg Spring sinkhole lake appear older and do not show signs of recent activity.

Photograph 4-19. Gopher Tortoise

Tortoise densities are affected by the amount of herbaceous ground cover on which they rely for food. Individuals often have multiple burrows and feeding is generally confined to within 164 feet of a burrow. Males have larger home ranges that average from 1.2 to 4.7 acres, depending on available food resources (FWC 2012b). Grass and small herbaceous plants make up most of the diet of gopher tortoises, although carrion, berries, and fungi are also eaten (FWC 2012b). Gopher tortoise populations have suffered from a variety of threats. The primary reason for declines includes conversion of natural forests of longleaf pine to loblolly (*Pinus taeda*) plantations, agriculture, and urban uses; absence of fire, which allows formation of a thick understory and midstory that blocks sunlight and prevents the growth of grasses and forbs used as food; illegal take of the tortoises for food or pets; harassment by dogs; and mortality of eggs and hatchlings from fire ants. In central Florida, urbanization, phosphate mining, and citrus production are the most immediate threats to tortoises (FWC 2012b). A recovery plan for gopher tortoise exists and provides additional information on natural history, management, and recovery (USFWS 1990b). This INRMP protects habitat for gopher tortoises through management of factors including vegetation management (Section 4.1.4, i.e., removal of abandoned citrus orchard and revegetation with native species), invasive plant species management (Section 4.1.5, i.e., removal of invasive plants from areas containing gopher tortoise burrows and minimizing introduction of invasive plant species), and fish and wildlife management (Section 4.3.1; i.e., management of wildlife using an ecosystem management approach). Projects that will benefit gopher tortoise on the LEFAC/Bugg Spring facility include removal of invasive plant species (Section 4.1.5.2), RTE species surveys (Section 4.3.2.2), and removal of abandoned citrus orchard to encourage forb growth (Section 4.1.4.2).

Incised Agrimony

Status: Endangered (Florida)

Incised agrimony (*Agrimonia incisa*) (Photograph 4-20) is a perennial herb with short, knotty rootstocks that are black and tuberous. The stems are thick with long and short hairs intermixed. There are usually 12 to 18 leaves per stem that are pinnately compound and hairy. The flowers grow on gray or whitish stems and the floral cup is hemispheric with several rows of hooked bristles. Incised agrimony grows in dry pine woodlands from east Texas to Florida and as far north as North Carolina. Activities in the INRMP that benefit incised agrimony potential habitat include erosion and stormwater control (Section 4.1.2, i.e., preservation of soil and prevention of soil

Photograph 4-20. Incised Agrimony (Credit Bobby Hattaway)

erosion), invasive plant species management (Section 4.1.5; i.e., removal and control of invasive plant species from forests on the LEFAC/Bugg Spring facility), and forest management (Section 4.2.1; i.e., maintenance of existing forest and control of invasive species that degrade them). Projects in the INRMP that would benefit incised agrimony if it occurs on the LEFAC/Bugg Spring facility include invasive plant removal (Section 4.1.5.2) and RTE species surveys (Section 4.3.2.2).

Lewton's Polygala

Status: Endangered (Federal and Florida)

Lewton's polygala (*Polygala lewtonii*) (Photograph 4-21) is a perennial herb that grows up to 8 inches tall with long, succulent leaves. Leaves are narrow, wider above the middle, and held erect in alternate, overlapping clusters along the stem. Flowers are small, dark pink, and contain two wing-like sepals and three small green sepals. The petals are fused into a keel with a projecting fringe. Lewton's polygala is endemic to central Florida and grows on oak scrub, sandhill habitats, and in the transition zones between high pine and turkey oak barrens. Activities in the INRMP that benefit Lewton's polygala potential habitat include erosion and stormwater control (Section 4.1.2, i.e., preservation of soil and prevention of soil erosion), invasive plant species management (Section 4.1.5; i.e., removal and control of invasive plant species from forests on the LEFAC/Bugg Spring facility), and forest management (Section 4.2.1; i.e., maintenance of existing forest and control of invasive species that degrade them). Projects in the INRMP that would benefit Lewton's polygala if it occurs on the LEFAC/Bugg Spring facility include invasive plant removal (Section 4.1.5.2) and RTE species surveys (Section 4.3.2.2).

Photograph 4-21. Lewton's Polygala (Credit Billy B. Boothe)

Lake Eustis Pupfish

Status: Species of Special Concern (Florida)

No suitable habitat for the Lake Eustis pupfish occurs on the LEFAC/Bugg Spring facility. However, it is known to occur in Lake Harris, into which Bugg Spring, the Okahumpka Marsh, and Lake Denham flow. Impacts on these waters could potentially impact downstream species in Lake Harris like the Lake Eustis pupfish. The Lake Eustis pupfish is a small (0.75 to 1.2 inches) stout-bodied fish that is beige to olive in color, with dark stripes and clear fins (Photograph 4-3). It inhabits very narrow, shallow zones of shoreline that are exposed to heavy wave action and typically lack vegetation (FNAI 2013a). This INRMP protects water quality and aquatic habitats

through management of factors including watershed and wetlands (Section 4.1.1; i.e., maintaining wetlands, ensuring compliance with environmental laws and DoD policy, monitoring water quality and quantity), erosion and stormwater (Section 4.1.2; i.e., maintaining water quality standards, preventing and reducing erosion, and avoiding the use of pesticides and fertilizers), floodplains (Section 4.1.3; i.e., manage any new development to avoid reducing the capacity of floodplains or increasing flooding rates), fish and wildlife management (Section 4.3.1; i.e., maintaining biological diversity and ecosystems and cooperating with wildlife management agencies), aquatic species management (Section 4.3.4; i.e., conserve aquatic habitats, avoid introduction and control invasive aquatic species). Controlling invasive blue tilapia and suckermouth catfish (Section 4.3.4.2) is the project in the INRMP that benefits Lake Eustis pupfish and its habitat.

Photograph 4-22. Lake Eustis Pupfish (Source FNAI 2013a)

Limpkin

Status: Species of Special Concern (Florida)

Limpkins are wading birds that superficially resemble rails. They have brown feathers, with white streaks on the head and neck. Limpkins have long necks and may grow up to 28 inches long with a wingspan of 42 inches. Most noticeable about their appearance is the downcurved bill, which they use to pry apple snails from their shells (Photograph 4-23). Apple snails are their primary prey, but limpkins also feed on a variety of invertebrates they find in and near shallow water along rivers, streams, lakes, marshes, and swamps. In the U.S., limpkins are found in southern Georgia and Florida (FWC 2013). They were almost extirpated from Florida due to overhunting, although that threat has been largely abated due to conservation efforts. The fragmentation, draining, polluting, and invasion of wetlands and aquatic habitat in Florida continue to threaten limpkin populations (FWC 2013). Limpkin were identified around the sinkhole lake during bird surveys in 2013 and anecdotal evidence of regular presence on the LEFAC/Bugg Spring facility exists. This INRMP protects aquatic and terrestrial habitats that benefit limpkins

Photograph 4-23. Limpkin (Credit FWC)

through management of factors including watershed and wetlands (Section 4.1.1; i.e., maintaining wetlands, ensuring compliance with environmental laws and DoD policy, monitoring water quality and quantity), erosion and stormwater (Section 4.1.2; i.e., maintaining water quality standards, preventing and reducing erosion, and avoiding the use of pesticides and fertilizers), floodplains (Section 4.1.3; i.e., manage any new development to avoid reducing the capacity of floodplains or increasing flooding rates), fish and wildlife management (Section 4.3.1; i.e., maintaining biological diversity and ecosystems and cooperating with wildlife management agencies), and aquatic species management (Section 4.3.4; i.e., conserve aquatic habitats, avoid introduction and control invasive aquatic species). Projects described in this INRMP that could benefit limpkins include RTE and bird surveys (Sections 4.3.2.2 and 4.3.3.2, respectively) and control of invasive fish species (Section 4.3.4.2).

Monarch Butterfly

Status: Petitioned (Federal)

The monarch butterfly (Photograph 4-24) is found throughout the United States during warm months, but migrates to Mexico during winter. Monarch caterpillars exclusively eat milkweed leaves, so the presence of milkweed (Asclepias spp.) is a crucial habitat requirement. Milkweed protection is therefore a key component of monarch butterfly conservation. This INRMP protects habitat for monarch butterflies through active management of factors such as erosion and stormwater control (Section 4.1.2, i.e., preservation of soil and prevention of soil erosion), invasive plant species management (Section 4.1.5; i.e., removal and control of invasive plant species from the LEFAC/Bugg Spring facility), and vegetation management (Section 4.1.4; i.e., removal of abandoned citrus orchard and revegetation of uplands with native species). Projects described in this INRMP that benefit and conserve monarch butterfly habitat include invasive plant removal (Section 4.1.5.2), RTE species surveys (Section 4.3.2.2), and removal and revegetation of abandoned citrus orchard (Section 4.1.4.2).

Photograph 4-24. Monarch Caterpillar and Adult (Credit www.gardeningknowhow.com)

Nodding Pinweed

Status: Threatened (Florida)

Nodding pinweed (*Lechea cernua*) (Photograph 4-25) is a small shrub-like perennial herb with several spreading, erect shoots. Leaves are narrowly ovate or elliptic and are typically less than 0.5-inch long. The stem and leaf surfaces are hairy and the basal leaves are very densely hairy on both surfaces. Flowering shoots are multi-branched and exhibit secondary branching. The outer sepals are shorter than inner sepals. Nodding pinweed is endemic to Florida and grows in deep soils, usually in a mixture of evergreen and scrub oak. Activities in the INRMP that benefit nodding pinweed potential habitat include erosion and stormwater control (Section 4.1.2, i.e., preservation of soil and prevention of soil erosion), invasive plant species management (Section 4.1.5; i.e., removal and control of invasive plant species from forests on the LEFAC/Bugg Spring facility), and forest management (Section 4.2.1; i.e., maintenance of existing forest and control of invasive species that degrade them). Projects in the INRMP that would benefit nodding pinweed if it occurs on the LEFAC/Bugg Spring facility include invasive plant removal (Section 4.1.5.2) and RTE species surveys (Section 4.3.2.2).

Photograph 4-25. Nodding Pinweed (Credit USDA-NRCS Plants Database)

Pigeon Wings

Status: Threatened (Florida)

Pigeon wings (*Clitoria fragrans*) (Photograph 4-26) is a perennial herb 6 to 20 inches tall, with erect, purplish, waxy stems. It has alternate leaves up to 2 inches long with three leathery leaflets. The upper surfaces of leaves are dark green with conspicuous veins and the lower surface of the leaves are pale green and waxy. Flowers are conspicuous and fragrant with two short wing petals that curve forward and almost cover two keel petals. Flowers also have a banner petal two inches long that is pink to lavender in color with purplish veins and a large white spot. Pigeon wings is endemic to central Florida and grows in turkey oak barrens, as well as scrub and scrubby pine. Activities in the

Photograph 4-26. Pigeon Wings (Credit Marnie L. Hutchenson)

INRMP that benefit pigeon wings potential habitat include erosion and stormwater control (Section 4.1.2, i.e., preservation of soil and prevention of soil erosion), invasive plant species management (Section 4.1.5; i.e., removal and control of invasive plant species from forests on the LEFAC/Bugg Spring facility), and forest management (Section 4.2.1; i.e., maintenance of existing forest and control of invasive species that degrade them). Projects in the INRMP that would benefit pigeon wings if it occurs on the LEFAC/Bugg Spring facility include invasive plant removal (Section 4.1.5.2) and RTE species surveys (Section 4.3.2.2).

Pineland Butterfly Pea

Status: Endangered (Florida)

Pineland butterfly pea (*Centrosema arenicola*) (Photograph 4-27) is a perennial vine with stems up to 10 feet long that twine over bushes. Its leaves are formed by three oval or lance-shaped leaflets that are up to 2 inches long and are dark green. The flowers are 1.5 inches wide and purplish-blue, and are twisted so that the large, notched banner petal is lowest. Pineland butterfly pea is endemic to central Florida and grows in sandhill, scrubby flatwoods, and dry upland habitats. Activities in the INRMP that benefit pineland butterfly pea potential habitat include erosion and stormwater control (Section 4.1.2, i.e., preservation of soil and prevention of soil erosion), invasive plant species management (Section 4.1.5; i.e., removal and control of invasive plant species from forests on the LEFAC/Bugg Spring facility), and forest management (Section 4.2.1; i.e., maintenance of existing forest and control of invasive species that degrade them). Projects in the INRMP that would benefit pineland butterfly pea if it occurs on the LEFAC/Bugg Spring facility include invasive plant removal (Section 4.1.5.2) and RTE species surveys (Section 4.3.2.2).

Photograph 4-27. Pineland Butterfly Pea (Credit FNAI)

Pinkroot

Status: Endangered (Florida)

Pinkroot (*Spigelia loganioides*) (Photograph 4-28) is a small herbaceous plant found on flooplains, wet woodlands, and swamps. It grows up to 12 inches tall and has opposite, sessile leaves with entire margins. The small, white flowers may grow terminally or in leaf axils. The flowers form a funnel-shaped corolla with five pointed lobes and appear from April through July. Activities in the INRMP that benefit pinkroot potential habitat include watershed and wetland

management (Section 4.1.1; i.e., identification and mapping of wetlands, minimization of negative impacts on wetlands), erosion and stormwater control (maintaining natural vegetation in wetland areas and reducing soil erosion), and flooplain management (Section 4.1.3; i.e., minimize development and impacts on floodplains and clear any blocked drainages to allow floodwaters to subside). The project that might benefit pinkroot if it occurs on the LEFAC/Bugg Spring facility includes RTE species surveys (Section 4.3.2.2).

Photograph 4-28. Pinkroot (Credit Shirley Denton)

Pygmy Fringetree

Status: Endangered (Federal)

Pygmy fringetree (*Chionanthus pygmaeus*) (Photograph 4-29) is a shrub or small tree that typically grows to less than 10 feet tall. The oval leaves are 2 to 4 inches long and are somewhat leathery and yellow-green in color. Flowers grow in clusters and are less than 0.5 inch long, with four narrow, white petals. Pygmy fringetree is endemic to central Florida and grows in scrub, sandhill, and xeric hammock habitats, primarily in the Lake Wales Ridge region. Activities in the INRMP that benefit pygmy fringetree potential habitat include erosion and stormwater control (Section 4.1.2, i.e., preservation of soil and prevention of soil erosion), invasive plant species management (Section 4.1.5; i.e., removal and control of invasive plant species from forests on the LEFAC/Bugg Spring facility), and forest management (Section 4.2.1; i.e., maintenance of existing forest and control of invasive species that degrade them). Projects in the INRMP that would benefit pygmy fringetree if it occurs on the LEFAC/Bugg Spring facility include invasive plant removal (Section 4.1.5.2) and RTE species surveys (Section 4.3.2.2).

Photograph 4-29. Pygmy Fringetree (Credit Gil Nelson)

Sand Skink

Status: Threatened (Federal)

The sand skink is a small lizard that spends the majority of its time below ground in loose sand. They can reach 5 inches in length and are shiny gray to light tan with vestigial legs that are practically nonfunctional (Photograph 4-8). Sand skinks have greatly reduced eyes, no external ear openings, a wedge-shaped snout, and a countersunk lower jaw, all thought to be adaptations

to life underground (USFWS 1999). The sand skink is endemic to sandy ridges of central Florida where it most commonly occupies sandy substrates in xeric uplands, especially in ecotones between high pine and scrub. While this is its optimal habitat, it is also known from areas with dense undergrowth and extensive canopy closure. Sand skinks are usually found between 2 and 4 inches below the ground surface and appear to be most active February to May. Sand skinks feed on a variety of arthropods that occur below ground, especially beetle larvae and termites (*Prorhinotermes* spp.) (USFWS 1999).

Because of its small size and secretive habits, very little is known about the presence, abundance, or population trends of sand skinks. The South Florida Multi-species Recovery Plan (USFWS 1999) provides some information about sank skink natural history and conservation. They are threatened by habitat destruction due to residential and agricultural development, and it is thought that 60 to 90 percent of their original habitat has been lost. Sand skinks were not detected on the LEFAC/Bugg Spring facility during surveys and field investigations in 2012 and 2013 and none are known from the immediate area. Management activities that benefit sand skink habitat on the LEFAC/Bugg Spring facility include vegetation management (Section 4.1.4; i.e., removal of abandoned citrus orchard and revegetation of uplands with native species), forestry management (Section 4.2.1; i.e., maintaining healthy forests and controlling invasive species along forest edges), and fish and wildlife management (Section 4.3.1; i.e., maintaining biological diversity using an ecosystem management approach and cooperating with fish and wildlife management agencies). Projects in the INRMP that could benefit sand skink if they are present include invasive plant removal (Section 4.1.5.2), RTE species surveys (Section 4.3.2.2), and removal and revegetation of abandoned citrus orchard (Section 4.1.4.2).

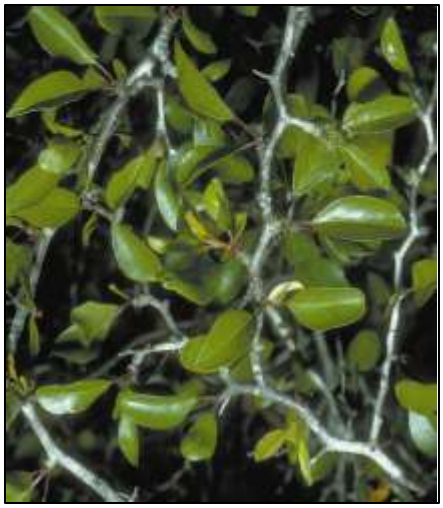
Photograph 4-30. Sand Skink (Credit FWC)

Scrub Plum

Status: Endangered (Federal)

Scrub plum (*Prunus geniculata*) (Photograph 4-31) is a shrub growing up to 6 feet tall with a densely branched crown and gnarled, partially buried trunk. Branches have spiny tips and leaves that are approximately 1 inch long with tiny, gland-tipped teeth. It is deciduous and grows small, white flowers with five petals. Scrub plum is endemic to central Florida and grows in sandhill and

oak scrub habitats. Activities in the INRMP that benefit scrub plum potential habitat include erosion and stormwater control (Section 4.1.2, i.e., preservation of soil and prevention of soil erosion), invasive plant species management (Section 4.1.5; i.e., removal and control of invasive plant species from forests on the LEFAC/Bugg Spring facility), and forest management (Section 4.2.1; i.e., maintenance of existing forest and control of invasive species that degrade them). Projects in the INRMP that would benefit scrub plum if it occurs on the LEFAC/Bugg Spring facility include invasive plant removal (Section 4.1.5.2) and RTE species surveys (Section 4.3.2.2).



Photograph 4-31. Scrub Plum (Credit Billy B. Boothe)

Sherman's Fox Squirrel

Status: Species of Special Concern (Florida)

Sherman's fox squirrels (*Sciurus niger shermani*) are highly unlikely to occur at the LEFAC/Bugg Spring facility. They are large squirrels with a black head or top of the head, a white nose, and white ears, with the remainder of its coat being all dark, all tan, or a mixture of tan and dark coloration (Kantola 1992) (Photograph 4-32). Average adults measure 2 feet long and weigh approximately 32 ounces (Kantola 1992). They range throughout much of peninsular Florida and southern Georgia (NatureServe 2013). Sherman's fox squirrel prefers longleaf pine sandhills and flatwoods containing both pines and oaks, such as along the edge of longleaf pine savannas and live oak forests (Kantola and Humphrey 1990) with large, mature trees and frequent fires.

Photograph 4-32. Sherman's Fox Squirrel (Credit David Jones)

Sherman's fox squirrels are considered species of concern due to patchy remaining available habitat, and many ongoing causes of habitat destruction and fragmentation such as extensive logging, conversion of habitat to pasture and short-rotation forestry, agricultural, commercial, and residential development (Kantola 1992). Potential habitat for Sherman's fox squirrels on the LEFAC/Bugg Spring facility is protected through forest management (Section 4.2.1; i.e., maintenance of existing forests and control of invasive species), and fish and wildlife management (Section 4.3.1; i.e., maintenance of biological diversity and ecosystem management, as well as cooperation with wildlife management agencies). Projects that could benefit Sherman's fox squirrel if they are present on the LEFAC/Bugg Spring facility include RTE species surveys (Section 4.3.2.2).

Short-tailed Snake

Status: Threatened (Florida)

The short-tailed snake (*Lampropeltis extenuata*) (Photograph 4-33) is endemic to Florida. It is known from Suwanee and Columbia counties to Hillsborough, Orange, and Highlands counties (Franz et al. 1992). Short-tailed snakes are not known to occur west of the Suwanee River. It is a slender, cylindrical-shaped snake with many dark blotches throughout its length of approximately 15 to 20 inches (Conant and Collins 1991). Short-tailed snakes inhabit early successional stages in dry, sandy upland pine scrub habitat, especially longleaf pine/turkey oak sandhills and sometimes adjacent xeric oak hammocks, rosemary-sand pine scrub habitat, or sphagnum bogs (Ashton and Ashton 1981, Carr and Goin 1955, Campbell and Moler 1992, Ernst and Ernst 2003). It burrows in the soil or in decomposing log debris or forest floor litter and is rarely seen above the soil surface. Short-tailed snakes are considered threatened due to loss of habitat through conversion to residential and agricultural uses, timber management programs in sand pine scrub, and surface mining. The INRMP protects short-tailed snake habitat through management of factors including vegetation management (Section 4.1.4; i.e., revegetation of abandoned agricultural orchard with native plants), forestry management (Section 4.2.1; i.e., control of invasive plant species along forest edges), and fish and wildlife management (Section 4.3.1; i.e., maintenance of biological diversity, application of ecosystem management, and cooperation with wildlife management agencies). INRMP projects that could benefit short-tailed snakes or their habitat if they occurred on the LEFAC/Bugg Spring facility include invasive plant species removal (Section 4.1.5.2), RTE species surveys (Section 4.3.2.2), and revegetation of the abandoned citrus orchard (Section 4.1.4.2).

Photograph 4-33. Short-tailed Snake (Credit Jacob Scott)

Southern Hog-nosed Snake

Status: Petitioned (Federal)

Southern hog-nosed snakes (Photograph 4-34) are most often associated with well drained, xeric, sandy soils where longleaf pine and scrub oaks are the characteristic woody vegetation. Wiregrass is often a significant component of the groundcover. Such habitats are necessarily fire-maintained. Ruderal habitats, including fallow fields, may also be used. Management activities directed at gopher tortoises on the Complex would also benefit Southern hog-nosed snakes. This

INRMP protects habitat for Southern hog-nosed snakes through active management of factors such as vegetation management (Section 4.1.4, i.e., removal of abandoned citrus orchard and revegetation with native species), invasive plant species management (Section 4.1.5, i.e., removal of invasive plants from areas containing gopher tortoise burrows and minimizing introduction of invasive plant species), and fish and wildlife management (Section 4.3.1; i.e., management of wildlife using an ecosystem management approach). Projects that will benefit southern hog-nosed snakes on the LEFAC/Bugg Spring facility include removal of invasive plant species (Section 4.1.5.2), RTE species surveys (Section 4.3.2.2), and removal of abandoned citrus orchard to encourage forb growth (Section 4.1.4.2).

Photograph 4-34. Southern Hog-nosed Snake (Credit Kevin Enge, FWC)

Spotted Turtle

Status: Petitioned (Federal)

The spotted turtle (Photograph 4-35) is a small turtle (max carapace length is about 15 cm) that inhabits a variety of wetland types, including vernal pools, swamps, marshes, small streams, wet meadows, and wet forests. Loss of wetlands habitat and invasive plants in wetlands habitats are the principal threats to the species. This INRMP protects habitat for spotted turtles through active management of factors such as wetlands (Section 4.1.1; i.e., maintaining wetlands, ensuring compliance with environmental laws and DoD policy, monitoring water quality and quantity), erosion and stormwater (Section 4.1.2; i.e., maintaining water quality standards, preventing and reducing erosion, and avoiding the use of pesticides and fertilizers), floodplains (Section 4.1.3; i.e., manage any new development to avoid reducing the capacity of floodplains or increasing flooding rates), fish and wildlife management (Section 4.3.1; i.e., maintaining biological diversity and ecosystems and cooperating with wildlife management agencies), and aquatic species management (Section 4.3.4; i.e., conserve aquatic habitats, avoid introduction and control invasive aquatic species). Projects described in this INRMP that benefit and conserve spotted

Photograph 4-35. Spotted Turtle (Credit Todd Pierson)

turtle habitat include invasive plant removal (Section 4.1.5.2) and RTE species surveys (Section 4.3.2.2).

Variable Leaf Plantain

Status: Threatened (Florida)

Variable leaf plantain (Photograph 4-36) is a small plant with purplish, ribbed stems that grows 40 to 80 inches tall. The ovate leaves have petioles with brownish hairs and grow up to 4 inches long. Variable leaf plantain flowers from August through September in peninsular Florida. It grows in wet soils along streams and swamps. It is found primarily in the Florida panhandle, but also grows in Alabama, Georgia, and central Florida. Activities in the INRMP that benefit variable leaf plantain potential habitat include watershed and wetland management (Section 4.1.1; i.e., identification and mapping of wetlands and minimization of negative impacts on wetlands), erosion and stormwater control (maintaining natural vegetation in wetland areas and reducing soil erosion), and floodplain management (Section 4.1.3; i.e., minimize development and impacts on floodplains and clear any blocked drainages to allow floodwaters to subside). The project that might benefit variable leaf plantain if it occurs on the LEFAC/Bugg Spring facility includes RTE species surveys (Section 4.3.2.2).

Photograph 4-36. Variable Leaf Plantain

Wood Stork

Status: Threatened (Federal)

The wood stork is a large, long-legged wading bird with a wingspan up to 65 inches (Photograph 4-37). Breeding wood storks primarily inhabit freshwater and estuaries and often establish colonies in swamps or islands protected by open water, where they build nests in trees (USFWS 1996). Wood storks forage by wading through water with their beaks immersed and open, snapping them shut whenever they feel a prey item. This allows foraging at night and in turbid or densely vegetated water; however, it requires relatively concentrated prey. Wood storks seek out areas where fish and other aquatic prey are concentrated by low water, especially where receding floodwaters trap stranded prey in pools. The primary cause of decline and threat to wood storks is a loss of suitable foraging and rookery habitats, and management for wood storks typically involves the maintenance of wetland habitats. Where wood storks breed or actively forage, buffer zones of at least 330 feet are recommended to reduce human disturbance. A

recovery plan for the U.S. breeding population of wood storks (USFWS 1996) is available and provides additional information on habitat needs and conservation.

Nesting wood stork colonies are very unlikely on the LEFAC/Bugg Spring facility due to the lack of expanses of open water surrounding potential nest sites, as well as the overall lack of sightings. The Bugg Spring sinkhole lake is likely too deep for effective foraging; however, the spring-run stream and associated wetlands, when flooded, are potential foraging habitat. The downstream lakes and marsh that are fed by Bugg Spring are within the 15-mile "core foraging area" of a wood stork colony known from northern Lake County, Florida (USFWS 2010). This INRMP protects habitat for wood storks through watershed and wetlands management (Section 4.1.1; i.e., mapping and preserving wetlands, ensuring compliance with Federal, state, and local laws and DoD policies, and monitoring spring water quality and quantity), erosion and stormwater control (Section 4.1.2; i.e., observing BMPs to maintain water quality standards and minimizing use of pesticides and fertilizers on the LEFAC/Bugg Spring facility), floodplain management (Section 4.1.3.1; i.e., managing land resources and any new development to maintain the floodplain on the LEFAC/Bugg Spring facility), forestry management (Section 4.2.1; i.e., maintain and enhance existing forested wetlands on the LEFAC/Bugg Spring facility), fish and wildlife management (Section 4.3; i.e., maintain native habitats using an ecosystem management approach and cooperate with agencies that manage fish and wildlife resources), migratory birds (Section 4.3.3, i.e., conducting bird surveys, preventing loss of habitat that could support wood storks, and maintaining native ecosystems), and aquatic species management (Section 4.3.4, i.e., conserving wetlands and spring-run stream to maintain biological diversity, avoiding introduction of aquatic invasive species). Projects described in this INRMP that could benefit wood storks if they were present include RTE and bird surveys (Sections 4.3.2.2 and 4.3.3.2, respectively) and control of invasive fish species (Section 4.3.4.2).

Photograph 4-37. Wood Stork (USFWS 2013b)

4.3.2.5 Additional Sources of Information

FNAI
http://www.fnai.org/

FWC
http://myfwc.com/

USFWS North Florida Ecological Services Office
7915 Baymeadows Way, Suite 200
Jacksonville, FL 32256
http://www.fws.gov/northflorida

4.3.3 Migratory Birds

The MBTA of 1918, as amended, and EO 13186 of 10 January 2001, Responsibilities of Federal Agencies to Protect Migratory Birds, explicitly extend Federal protection to migratory birds. The MBTA makes it illegal to pursue, hunt, kill, capture, possess, buy, sell, purchase, or barter any migratory bird, including the feathers or other parts, nests, eggs, or migratory bird products, except as allowed by the implementing regulations. Game birds are not protected by this Act, but their takes are governed by State hunting regulations. EO 13186 requires that Federal agencies avoid or minimize the impacts of their activities on migratory birds and make efforts to protect birds and their habitat.

Migratory birds face serious challenges that result in population declines, including reductions in habitat quality and quantity, direct bird mortality attributable to human activities, invasive species, collisions with artificial structures, and environmental contaminants. Because migratory birds cross the boundaries of nations, watersheds, and ecosystems, protecting them requires a coordinated effort involving multiple jurisdictions and interests. However, the 2003 National Defense Authorization Act exempts the Armed Forces from prohibitions on the incidental taking of migratory birds during military readiness activities. Military readiness activities include all training and operations of the Armed Forces that relate to combat and the adequate testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use. The MBTA also requires that the Secretary of Defense and Secretary of the Interior identify ways to minimize, mitigate, and monitor the take of migratory birds during military readiness activities. DoD participates in the Partners in Flight program, which seeks to benefit bird species through natural resources management while supporting mission needs. Minimal potential conflict with migratory birds exists at the LEFAC/Bugg Spring facility and this INRMP is expected to benefit migratory birds at the LEFAC/Bugg Spring facility through the implementation of projects to protect and enhance wetlands, forests, and other habitats important to migratory birds.

4.3.3.1 Goals and Objectives

- Conduct a breeding bird survey.
- Prevent loss of forested wetland and upland and maintain habitat quality while supporting the training mission.
- Maintain, or reestablish where practicable, native ecosystems.

4.3.3.2 Projects

Participation in the following project will occur in support of the goals and objectives for migratory birds. Project No. 3: Conduct bird surveys and identify any bird rookeries on the LEFAC/Bugg Spring facility.

4.3.3.3 Management Strategies

Avoiding and minimizing impacts to migratory birds begins with an up-to-date working knowledge of species presence, seasonality, nesting habits, and habitat condition on the installation. Regular migratory bird surveys are therefore essential to inform NEPA analyses. These surveys shall follow the guidance and recommendations in the DOD Coordinated Bird Monitoring Plan for survey design and data management. Additional guidance and information is available on the DOD Partners in Flight Monitoring Working Group website (www.dodpif.org). Collected data will be used to avoid, minimize, and mitigate impacts to migratory birds resulting from activities on the LEFAC/Bugg Spring facility. Because most migratory birds cross installation and state boundaries, data sharing is a vital component to their management. Data collected at the LEFAC/Bugg Spring facility will be shared with federal and state agencies through participation in programs such as the Breeding Bird Research and Monitoring Database (BBIRD), eBird, and Monitoring Avian Productivity and Survivorship (MAPS). Features like rookeries or raptor nests that may be significant to migratory birds should also be noted during any field surveys or investigations. Any bird species detected during field surveys in support of this INRMP development are also recorded and are included in Appendix B. Implementation of the following management measures will minimize, mitigate, and monitor the take of migratory birds resulting from military readiness activities at the LEFAC/Bugg Spring facility.

1. Conduct bird surveys on the LEFAC/Bugg Spring facility every 5 years beginning 2018 (Bird surveys were performed in 2013 during the development of this INRMP) by using the recommendations provided in the DOD Coordinated Bird Monitoring Plan to guide survey design and data management.
2. Where possible, the LEFAC/Bugg Spring facility will enter into conservation partnerships with Federal, state, and local agencies and NGOs to improve habitat.
3. Where possible, site military readiness activities in ways to avoid or minimize impacts on migratory birds. If LEFAC/Bugg Spring facility personnel note clear evidence of take of any migratory bird as a result of military readiness activities, LEFAC/Bugg Spring facility personnel will document the take, evaluate these activities, and where practicable, reduce or eliminate the take of migratory birds.
4. For non-military readiness activities, compliance with the MBTA is mandatory.

4.3.3.4 Additional Sources of Information

Partners in Flight
http://www.partnersinflight.org

Bird Conservation Plan for East Gulf Coastal Plain
http://www.blm.gov/wildlife/pl_04sum.htm

Smithsonian National Zoological Park
Migratory Bird Center
Washington, DC 20008
http://nationalzoo.si.edu/ConservationAndScience/MigratoryBirds/

USFWS Division of Migratory Bird Management
http://www.fws.gov/migratorybirds/

MBTA
http://www.fws.gov/laws/lawsdigest/migtrea.html

The Nature Conservancy Migratory Bird Program
http://www.nature.org/initiatives/programs/birds/

4.3.4 Aquatic Species Management

Aquatic habitats on the LEFAC/Bugg Spring facility are fed by the Floridan Aquifer, which discharges water through Bugg Spring and forms a sinkhole lake that drains through a spring-run stream into marsh and larger lakes to the north. In addition to the lake and spring-run stream, wetlands and flood prone bottomland hardwood forest help support aquatic species. All water bodies on the LEFAC/Bugg Spring facility are fresh, inland waters with no direct connections to the coast.

Blue tilapia and suckermouth catfish were identified in the Bugg Spring sinkhole lake. These fish are invasive species that can displace native species and alter aquatic communities. If uncontrolled they can become firmly established in waterways like the sinkhole lake and spring-run stream and may also spread to downstream bodies of water.

The Magnuson-Stevens Fishery Conservation and Management Act of 1996 requires that NMFS, the regional fishery management councils, and the Secretary of Commerce describe and identify Essential Fish Habitat (EFH) for important marine and anadromous fish species under Federal Fishery Management Plans. EFH includes all waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity, and extends from offshore habitats to inland areas, where the saltwater influence subsides. No EFH is present on the the LEFAC/Bugg Spring facility or connected waterways.

In accordance with EO 13089, Coral Reef Protection of 11 June 1998, which requires Federal agencies to protect and enhance coral reefs and coral reef systems, the Navy recognizes that coral reefs and related endemic mangrove and sea grass ecosystems are biologically rich and

diverse habitats. There are no coral reef, mangrove, or sea grass ecosystems within the area of influence of this INRMP.

4.3.4.1 Goals and Objectives

- Maintain or enhance biological diversity.
- Conserve wetlands, floodplains, stream and lake riparian areas, and soils.
- Avoid introduction of invasive aquatic species.
- Control blue tilapia and suckermouth catfish in the sinkhole lake and spring-run stream.

4.3.4.2 Projects

Project No. 5 involves the removal and control of blue tilapia and suckermouth catfish. Because the Bugg Spring sinkhole lake connects with other bodies of water that contain protected fish species and are used by humans, use of a fish poison is not recommended. Also, since Bugg Spring constantly discharges water into the sinkhole lake, control methods that involve draining the lake are unfeasible. Instead, control methods that reduce and minimize invasive fish populations, such as netting, trapping, and line fishing, should be considered. Support of other goals and objectives for aquatic species management are accomplished through other program elements, like wetland management and erosion control.

4.3.4.3 Management Strategies

1. Assist in the management and recovery of RTE species.
2. Manage fish and wildlife using an ecosystem management approach.
3. Periodically remove blue tilapia and suckermouth catfish from the sinkhole lake and spring-run stream.
4. Build interagency relationships with FWC, NMFS, and USFWS to cooperatively manage fish and wildlife resources and their habitats.

4.3.4.4 Additional Sources of Information

FWC
http://myfwc.com/

USFWS North Florida Ecological Services Office
7915 Baymeadows Way, Suite 200
Jacksonville, FL 32256
http://www.fws.gov/northflorida

4.4 CONSERVATION LAW ENFORCEMENT

Section 107 of the SAIA (16 U.S.C. 670e-2) requires sufficient numbers of professionally trained natural resources management personnel and natural resources law enforcement personnel to be available and assigned responsibility to perform tasks necessary to carry out Title I of the SAIA, including the preparation and implementation of INRMPs. Because the LEFAC/Bugg Spring facility is a relatively small piece of property that does not allow recreational hunting, fishing, or recreational use, the role of conservation law enforcement there will likely be limited.

4.4.1 Goals and Objectives

- Enforce Federal, state, and installation laws and regulations pertaining to fish and wildlife.
- Build interagency relationships with FWC and USFWS to support the Wildlife and Fisheries law enforcement program.
- Identify staffing needs and workloads to manage natural resources on the LEFAC/Bugg Spring facility.

4.4.2 Projects

No projects are designated to address conservation and law enforcement, as this is a function of the LEFAC/Bugg Spring facility operations and maintenance(O&M[N]) program.

4.4.3 Management Strategies

A number of laws and regulations apply to the natural resources management at the LEFAC/Bugg Spring facility and military bases around the country. Table 4-2 lists the Federal laws and regulations applicable to the LEFAC/Bugg Spring facility.

Table 4-2. Laws, Regulations, Executive Orders, and Instructions Applying to Natural Resources Management at Navy Installations

Number	Title	Description (where necessary)
Public Law (PL) 65-186 (16 U.S.C. 703)	MBTA, as amended	Prohibits taking or harming a migratory bird, its eggs, nest, or young without the appropriate permit.
PL 85-337 (10 U.S.C. 2671)	Military Reservation and Facilities - Hunting, Fishing, and Trapping	Provides that hunting, fishing, and trapping on military lands will be in accordance with state laws.
PL 86-624 & 96-366 (16 U.S.C. 661 et seq.)	Fish and Wildlife Coordination Act, as amended	Provides for effective integration of the fish and wildlife conservation programs with Federal water resource development and construction projects having impact on water resources.

Table 4-2, continued

Number	Title	Description (where necessary)
PL 86-797 (16 U.S.C. 670a – 670f)	SAIA as amended by PL 99-561	Requires each military department manage natural resources, including all fish and wildlife species, in accordance with a tripartite cooperative plan agreed to by USFWS and state wildlife agency; to train personnel in fish and wildlife management, and prioritize contracting work with Federal/state agencies.
PL 88-29 16 U.S.C. 2901 *et seq*.	Outdoor Recreation Program/Organic Act	Requires consultations with the National Park Service regarding management for outdoor recreation.
PL 89-669 (16 U.S.C. 2901 et seq.)	Fish and Wildlife Conservation Act	Provides for conservation, protection, restoration, and propagation of native species of fish and wildlife, including migratory birds threatened with extinction.
PL 90-542	Wild and Scenic Rivers Act	Requires identification and protection of any river or stream that qualifies under the Act.
PL 90-543	National Trails Systems Act of 1986	Promotes development of recreational, scenic, historic trails for persons for diverse interest and abilities.
PL 91-190 42 U.S.C. 4321 et seq.	NEPA, as amended	Preserves important natural aspects of national heritage and enhance quality of renewable resources.
PL 92-500	Federal Water Pollution Control Act (Clean Water Act)	Regulates dredging/filling of wetlands and regulates point and nonpoint sources discharges into waterways.
PL 92-205	ESA	Provides for the identification and protection of threatened and endangered species and critical habitats.
PL 93-639	Non-game Species Act	Encourages management for non-game species.
PL 93-639	Federal Noxious Weed Act	Establishes control and eradication of noxious weeds and regulates them in interstate and foreign commerce.
10 U.S.C. 2665	Military Construction Authorization Act - Sale of Certain Interest in Lands; Logs	Authorizes the sale of forest products to finance the cost of managing forest resources for commercial production.
10 U.S.C. 2667	Leases; Non-Excess Property	Provides for outleasing public lands for agricultural purposes and retention of cash receipts for administration of the program; improvement of existing leased areas; preparing new areas for outleasing.
16 U.S.C. 590a	Soil Conservation Act	Provides for application of soil conservation practices on Federal lands.
16 U.S.C. 668 et seq.	Bald and Golden Eagle Protection Act	Prohibits the taking (harassment, sale, or transportation) of bald or golden eagles, alive or dead, whole or parts, nest and/or eggs.
42 U.S.C. 1962d	Water Resources Planning Act of 1965, as amended	Provides for the optimum development of the Nation's natural resources through water resources planning.

Table 4-2, continued

Number	Title	Description (where necessary)
PL 1972	Federal Insecticide, Fungicide, & Rodenticide Act	Governs the use and application of pesticides in natural resources management programs.
PL 56-510 42 U.S.C. 9601	Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	As amended by Superfund Amendments and Reauthorization Act of 1986, CERCLA establishes programs for the cleanup of hazardous waste disposal and spill sites nationwide. Requires protection of human health and the environment. Work under this legislation is conducted under the Navy Installation Restoration Program.
PL 101-380 33 U.S.C. 2701	Oil Pollution Act of 1990	Redefines requirements of the National Contingency Plan to include planning for rescue of, minimization of injury to, and assessment of damages/injury to fish and wildlife resources.
PL 94-265 16 U.S.C. 1801	Magnuson-Stevens Fishery Conservation and Management 31 Act of 1996	Provides for the conservation and management of marine and anadromous fish species.
PL 94-580 42 U.S.C. 6901	Resource Conservation and Recovery Act	Limits landfills, stimulus for recycling, regulates handling and disposal of solid wastes, regulates underground storage tanks.
PL 91-604 42 U.S.C. 7401	Clean Air Act	Regulates emissions, delegates authority to regulate prescribed burning to the states.
5 U.S.C. 551	Administrative Procedures Act	Allows public to sue to enforce other laws or for not following established procedures or other abuse of discretion.
5 U.S.C. 552	Freedom of Information Act	Provides access to the public for most Federal documents.
PL 101- 511 section 8120	Defense Appropriations Act of 1991 Legacy Program	Establishes program for stewardship of biological, geophysical, cultural, and historic resources on DoD lands.
40 CFR 300.600 40 CFR 300.615	Natural Oil and Hazardous Substances Pollution Contingency Plan, Designation of Federal Trustees, Responsibilities of Trustees	Requirements of the National Contingency Plan to include planning for rescue of, minimization of injury to, and assessment of damages/injury to fish and wildlife resources.
50 CFR 1-end	Wildlife and Fisheries	50 CFR 402 Inter-agency Cooperation – ESA of 1973, 50 CFR 10.13, List of Migratory Birds.
EOs 11514 and 11991	Protection and Enhancement of Environmental Quality	Directs issuance of instructions and guidelines relative to preparation of EIS.

Table 4-2, continued

Number	Title	Description (where necessary)
EO 11990	Protection of Wetlands	Requires agencies to take action to minimize destruction, loss, or degradation of wetlands.
EO 11988	Floodplain Management, as amended by EO 12608	Directs Federal agencies to avoid developments within floodplains.
EOs 11989 and 12608	Off-Road Vehicles on Public Lands	Provides for closing areas to off-road vehicle use where natural resources are adversely affected.
EO 13089	Coral Reef Protection	Directs Federal agencies to identify effects of their actions on coral reefs, protect and enhance such ecosystems, and ensure that their actions will not degrade existing conditions.
DODINST 6050.2	Use of Off-Road Vehicles on DoD Lands	Prohibits off-road vehicles without an EA.
MOU – 7 April, 1978	MOU - Outdoor Recreation on Military Installations	MOU between U.S. Department of Interior and DoD for the development of public outdoor recreation resources on military installations.
OPNAVINST 5090.1B	Environmental and Natural Resources Program Manual	Navy instruction governing land, forest, fish and wildlife, outdoor recreation, NEPA, and all other environmental concerns.
NAVFAC Instruction 6250.3F	Performance and Reporting of Pest Control Operations in the Naval Shore Establishment	Navy instructions and regulations regarding pest control and pesticide use.
NAVFAC Instruction 7110	Fish and Wildlife and Game Conservation and Rehabilitation; Funds Management	Fish and Wildlife conservation funds management.
NAVFAC Instruction 11010.70	Facility Planning and the Protection of Cultural Resources	Part of a comprehensive planning approach for land use and the utilization of existing facilities to support mission needs, while protecting cultural resources on an installation.
NAVFAC Instruction MO-110.1	Natural Resources Land Management	All installations and facilities with appropriate land and water areas are to have active, progressive programs for the management and conservation of natural resources.

Table 4-2, continued

Number	Title	Description (where necessary)
NAVFAC Instruction MO-110.2	Forest Management	A technical management plan must be established and maintained for all installations that have land areas suitable for forest resources management programs. Such plans should be developed by professional foresters within the Department of the Navy, or with the aid of Federal or state forestry agencies or consulting foresters where additional assistance is needed.
NAVFAC Instruction MO-110.3	Fish and Wildlife Management	A management plan should provide for a continuing program of fish and wildlife habitat management, and the integration of the aspects of natural beauty and conservation of other natural resources.
NAVFAC Instruction MO-100.4	Guidance on Special Interest Areas	Provides guidance for outdoor recreation management and planning and Cultural Resources protection.
Secretary of Navy Instruction 6240.6E	Environmental Protection and Natural Resources Management Program	Implementation of DoD directives under DoD Instruction 4700.4.
DoDINST 4700.2	The Secretary of Defense Natural Resources Conservation Award	The Navy annually recognizes those installations which have maintained and improved the natural beauty of the installation using progressive conservation programs.
DoDINST 4715.3	Environmental Conservation Program	Implements policy, assigns responsibilities, prescribes procedures for integrated management of natural and cultural resources.
DoDINST 7310.5	Accounting for Production and Sale of Forest Products	Prescribes policies and procedures for an integrated program for multiple-use management of natural resources on a DoD-controlled property.
DoD Directive 4700.4 (also 32 CFR 190)	Natural Resources Management Program	Provides DoD policy on natural resources management.
Navy Comptroller Manual Volume 3	Navy Comptroller Manual Volume 3	Provides Navy guidance on tracking of timber sale receipts.
NAVFAC P-73	Real Estate Operations and Natural Resources Procedural Manual	Provides comprehensive guide on all CNO natural resources program requirements and standards.

4.4.4 Additional Sources of Information

The *Federal Register* is the official daily publication for rules, proposed rules, and notices of Federal agencies and organizations, as well as EOs and other presidential documents:

Office of the Federal Register
http://www.gpoaccess.gov/fr/index.html

MBTA
http://www.fws.gov/permits/mbpermits/regulations/mbta.html

The Nature Conservancy
Migratory Bird Program
http://www.nature.org/initiatives/programs/birds/

FWC
http://myfwc.com/

USFWS North Florida Ecological Services Office
7915 Baymeadows Way, Suite 200
Jacksonville, FL 32256
http://www.fws.gov/northflorida

4.5 Training of Natural Resources Personnel

This section addresses the development and implementation of programs and techniques for training natural resources personnel. The training issues of this INRMP include training of GIS data integration, access, and reporting.

4.5.1 Pesticide Applicator Training

All the LEFAC/Bugg Spring facility personnel who apply pesticides shall have received and maintained DoD (government staff) or Florida (contractors) certification as pesticide applicators for the categories of pest control engaged. It is anticipated that the frequency and amount of pesticide use on the LEFAC/Bugg Spring facility will be relatively limited and will likely not justify an on-site employee maintaining a pesticide applicator license.

4.5.1.1 Federal Personnel

Federal personnel applying any pesticide on Federal land need DoD certification in accordance with OPNAVINST 6250.4B. Only Federal employees under hiring programs with duties as pesticide applicators can participate in the on-the-job training program. During this time, the new employee works under the direct supervision of a certified pesticide applicator, until they are

qualified (1 year of on-the-job experience) and satisfactorily complete the DoD Pest Management Certification Course and can work independently.

4.5.1.2 Civilian Contractors

Civilian contractors applying any pesticide on the LEFAC/Bugg Spring facility require a Florida certification in the category or applicable subcategories of work performed. All of the contractor's pest management staff who apply pesticides must be certified as pesticide applicators. Non-certified contractor employees are prohibited from applying pesticides.

4.5.1.3 Inspectors

Individuals who evaluate the quality of work of pest control contracts should also be trained in the pest management category or categories of work being performed.

4.5.1.4 Supervisor

Direct supervision is defined in DoD Instruction 4150.7 as supervision that includes being at the specific location where pest management work is conducted; providing instruction and control; and maintaining a line-of-sight view of the work performed. Certain circumstances, such as topographic, vegetation, and structural constraints, may temporarily remove the line-of-sight view of the application of pesticide from the supervisor. Under these temporary circumstances, the supervisor shall be responsible for the actions of the pesticide applicators.

4.5.1.5 Training and Certification

Training and certification will be conducted at government expense for DoD personnel. Certified pest control personnel shall be re-certified in accordance with Florida or DoD requirements as specified above. Employed pesticide applicators must be certified and the quality assurance evaluator must be trained in the following categories when appropriate. Certification and training is required when performing pest control operations that involve restricted-use or state-limited-use pesticides, to supervise other employees conducting pest control involving restricted-use or state-limited-use pesticides, or to evaluate contractor performance relating to pest control within these categories:

a. Forest pest control (DoD & EPA category 2; MS C).
b. Ornamental and turf pest control (DoD & EPA category 3; MS D).
c. Aquatic pest control (DoD & EPA category 5; MS B).
d. Right-of-way pest control (DoD & EPA category 6; MS C).
e. Industrial, Institutional, Structural, and Health Related pest control (DoD & EPA category 7; MS E).

f. Public health (DoD & EPA category 8; MS VIII).

g. Aerial Application (DoD & EPA category 11; MS IB) if planned to be used.

4.5.1.6 Continuing Education and Training

Personnel, who are involved in pesticide applications on a regular or seasonal basis, especially when mixing formulations is required, are encouraged to attend local pest management classes, workshops, and seminars. This is important in order to keep abreast of pest problems and pest management techniques that are unique to the area surrounding an installation. This is particularly true when dealing with vegetation control since many of the herbicide labels indicate that choices in strength and application technique should be based on local conditions. The time and labor expended in this type of training is easily recouped through improved efficiency in pest management. Local pest management training may include on-site training in addition to any off-site re-certification training, such as a DoD course or state re-certification requirements. Other personnel who deal directly with pest control operations, but who may not need to be certified, are also encouraged to attend local seminars to better understand pest management needs.

4.5.2 GIS, Data Integration, Access, and Reporting

Mapping and spatial analysis are integral components of natural resources management that are fulfilled through the use of GIS data and software. Data provide documentation for the location and attributes of resources while software contains the tools necessary for the management, display, and analysis of these data. A major goal of any GIS is the development of rigorous organization and accuracy standards. These standards provide for a sound base dataset needed for rigorous analysis used in managing natural resources.

4.5.2.1 Goals and Objectives

- Develop a GIS database that can be used to interactively and proactively manage the natural resources on the LEFAC/Bugg Spring facility.
- Prevent conflicts with long-term management goals and training missions.

4.5.2.2 Projects

No projects are identified to address GIS development, and a database was created for storing data collected during the development of this INRMP and during threatened and endangered species surveys, which will serve as the initial GIS database for tracking natural resources on the LEFAC/Bugg Spring facility.

4.5.2.3 Management Strategies

GIS databases and mapping capabilities can be used for routine and long-term planning of natural resources. This work is driven by laws such as NEPA, ESA, and Clean Water Act. For

NEPA compliance, all impacts on Federal land from a proposed project must be considered before the project can be implemented. These impacts may affect natural resources such as endangered species or water resources, so detailed maps are required to assess the potential impact on the environment. A list of data layers that the database will likely contain is provided below.

- RTE species occurrences
- Facility boundaries
- Soils
- Structures and infrastructure
- Invasive species occurrences
- Streams and wetlands
- Archaeological sites
- Solid waste management areas
- Hazardous waste management
- Remediation areas
- Stormwater pollution prevention

Along with these data layers, the LEFAC/Bugg Spring facility will also have access to NAVFAC Southeast Georeadiness Center ancillary data that can affect a project, such as infrastructure, installation boundaries, and geodetic reference points.

All of the aforementioned types of GIS analysis require accurate, updated datasets and the ability to share current data and communicate data updates with users. The NAVFAC Southeast Georeadiness Center will maintain a server where finalized data, intermediate working data, and all supporting files are stored.

4.6 INRMP UPDATES

4.6.1 INRMP Review and Updates

Effective natural resources management requires an INRMP that is updated to reflect the changing conditions and operations on an installation. These updates and an adaptive management approach necessitate regular reviews of environmental conditions, management strategies, and effectiveness of management actions.

4.6.1.1 Goals and Objectives

- Maintain an up-to-date INRMP

4.6.1.2 Projects

Project No. 6: Update INRMP annually.

4.6.1.3 Management Strategies

1. Review data from natural resources surveys, habitat changes, and any new mission requirements that might impact natural resources so that the INRMP can be updated to reflect current conditions and mission needs. The annual INRMP reviews and natural resources metrics located at the Natural Resources Data Call Station website (https://clients.emainc.com/dcs/navfac/) will be used to evaluate INRMP implementation. The INRMP can then be updated with the most current information and the evaluation can be completed using the conservation website that is part of the Navy Environmental Program Requirements system (EPRweb), https://eprportal.cnic.navy.mil.

5.0 IMPLEMENTATION

This chapter describes the implementation and update procedures for the INRMP and discusses planning and mission sustainability, partnerships with other agencies, and funding of INRMP projects. Section 5.5 provides information on the purpose of each project, its relevance to the goals and objectives listed in Section 4, and the location, description, baseline conditions, monitoring, and legal requirements driving each project. Projects were identified by the LEFAC/Bugg Spring facility in cooperation with foresters, fish and wildlife biologists, and soil conservationists at NAVFAC Southeast Core, as well as with Federal, state, and county wildlife biologists, foresters, and land managers.

The natural resources programs and projects are divided into mandatory and stewardship categories to reflect implementation priorities. The LEFAC/Bugg Spring facility intends to implement the projects as described below to the greatest extent possible. The implementation of projects is largely dependent upon availability of funds. Funding for implementation of the INRMP will come from the Commander, Navy Region Southeast (CNRSE), or NAVFAC Southeast natural resources fund. Every effort will be made to acquire O&M(N) Environmental or other funding to implement DoD mandatory projects, in the timeliest manner possible. Stewardship projects will be funded through fish and wildlife licenses or other fund sources as funds and personnel become available. Forestry funding is provided through NAVFAC Southeast from the sale of timber products. Funding for special projects in natural resources may be available from NAVFAC Southeast through surplus funding sources or forestry reserve accounts. Non-compliance funding may come from the Legacy Act. Funding for compliance with environmental legislation and regulations is requested through the Navy Environmental Program Requirements Web (EPRWeb).

Over the course of its implementation, the INRMP will

- Enable the LEFAC/Bugg Spring facility to make progress towards achieving a sustainable natural resources base and maintain conditions necessary for achieving its military mission;
- Establish appropriate stewardship policies that serve to protect natural resources;
- Ensure compliance with environmental laws;
- Provide a continuity of direction and effort that can accommodate changes in personnel and leadership;
- Promote cost-effectiveness through better planning and coordination;

- Promote good public relations by demonstrating the installation's commitment to stewardship; and
- Make use of innovative strategies to accomplish specific management objectives.

5.1 PLAN IMPLEMENTATION, REVIEW, AND UPDATES

A general summary of major actions/projects during the next 10 years and programs they support are provided in Section 5.4. New actions, mission requirements, projects, or natural resources related issues will be incorporated into the INRMP during annual updates. Projects will be developed during the budgetary process and coordinated with CNRSE natural resources personnel.

5.2 PLANNING AND MISSION SUSTAINABILITY

The goal at the LEFAC/Bugg Spring facility is to maintain or enhance sonar testing and calibration capabilities while conserving natural resources. NSA Orlando has the primary role and responsibility for the implementation of the INRMP.

The implementation of projects, future revisions, and updates to this INRMP will assist NSA Orlando in maintaining natural habitats, assessing the impacts of military activities on flora and fauna, controlling erosion and sedimentation, and implementing ecosystem management at the LEFAC/Bugg Spring facility.

5.3 PARTNERSHIPS

Assistance from outside organizations can be beneficial and usually takes the form of a partnership that may include funding, technical and logistical support, GIS, use of FWC biologists, or an agreement between agencies to achieve common goals. Agencies with shared goals or that have relevant expertise include the following:

- NRCS- to provide expertise on soil erosion control
- USACE- to assess and manage wetlands
- USFWS- to assist in identifying conservation measures for the enhancement of threatened and endangered species and their habitat
- FWC- to assess habitat and species management strategies

5.4 FUNDING

Funding for implementation of the INRMP will come from the CNRSE or NAVFAC Southeast natural resources fund. The natural resources programs and projects described in this INRMP are divided into mandatory and stewardship categories to reflect implementation priorities. Every effort will be made to acquire Navy O&M(N) Environmental funding, or other funding sources, to implement DoD mandatory projects in the timeliest manner possible. Stewardship projects will be funded as money and personnel become available.

Funding for special projects in natural resources may be available from NAVFAC Southeast through surplus funding sources. Funding for compliance with environmental legislation and regulations is requested through the Navy's Environmental Program Requirements Website. Compliance projects include species surveys, assessments, management, protection, INRMP updates, wetlands delineation and protection, conservation mapping, nonpoint source pollution, watershed management, cultural resources surveys, protection and plans, archaeological curation, conservation of soil and water or fish and wildlife, forest management, and outdoor recreation (wildlife).

Table 5-1 summarizes the proposed projects for the LEFAC/Bugg Spring facility. One of the objectives of the INRMP is to plan for no net loss of military mission. Partnerships, proper funding, and compliance with NEPA requirements will ensure that the Navy will achieve its military mission.

Table 5-1. Summary of Recommended Projects

LEFAC/Bugg Spring INRMP Projects						
Project No.	**Project Description**	**Scheduled Implementation (Fiscal Year)**	**Prime Legal Driver**	**Navy Assessment Level[a]**	**Funding Priority[b]**	**Annually Recurring**
1	Invasive Plant Removal	2014	Management of Undesirable Plants on Federal Lands and EO 13112	1	M	Annually
2[c]	RTE and Protected Species Surveys	2018	ESA	1	M	Non-annually
3[c]	Bird Surveys	2018	ESA, MBTA, and EO 13186	1	M	Non-annually

Table 5-1, continued

LEFAC/Bugg Spring INRMP Projects						
Project No.	**Project Description**	**Scheduled Implementation (Fiscal Year)**	**Prime Legal Driver**	**Navy Assessment Level[a]**	**Funding Priority[b]**	**Annually Recurring**
4	Revegetate Citrus Orchard	2016	ESA, Management of Undesirable Plants on Federal Lands and EO 13112	1	S	Annually
5	Control Invasive Fish Species	2016	Management of Undesirable Species on Federal Lands	1	S	Annually
6	Update INRMP	2014	Sikes Act	1	M	Annually

Notes: Recommended projects are dependent on natural resources management priorities and amounts are subject to available funding allocations.
- a From EPR "Guidebook" (Cookbook)
- b From DoD Instruction 4715.3, Enclosure (4) M= Mandatory S= Stewardship
- c Contract under way in 2013 and 2014 that includes surveys for protected terrestrial species and birds.

5.5 PROJECT INFORMATION

Project No. 1: Invasive Plant Removal

Purpose: The control of invasive and exotic plant species at the LEFAC/Bugg Spring facility to acceptable levels to promote native ecosystems.

Goal(s) and Strategy: Goal - Prevent the introduction and spread of invasive species.
Management Strategies (Section 4.1.5.3) 1,2,3,4,5, and 6.

Goal - Control and minimize infestations of existing invasive terrestrial plant species such as camphor tree, coral ardisia, bamboo, Chinese tallow tree, and winged yam.

Management Strategies (Section 4.1.5.3) 1,2,3,4, and 6

Goal - Monitor invasive plant and animal species as needed to inform management decisions and adjust control regimens.

Management Strategy (Section 4.1.5.3) 4
Goal - Maintain, or reestablish where practicable, native ecosystems and habitats.

Management Strategies (Section 4.1.5.3) 1,2,3,5, and 6

Goal - Cooperate with regional invasive species management efforts.

Management Strategies (Section 4.1.5.3) 1, and 6

Location: LEFAC/Bugg Spring facility.

Description: Control invasive species to protect and enhance native ecosystems. Invasive and exotic plant species identified at the LEFAC/Bugg Spring facility include winged yam, coral ardisia, bamboo, Chinese tallow, and camphor tree. LEFAC/Bugg Spring will survey the extent of invasive and exotic plant species on all properties and develop a control plan that will identify and describe invasive and exotic plant species and schedule removal efforts. This plan will be implemented to reduce these species to acceptable levels. The LEFAC/Bugg Spring facility will consider the applicability of burning or hand clearing in combination with herbicides, as well as non-herbicide removal methods alone.

Baseline: Baseline will be established during the survey phase of the project.

Monitoring: The LEFAC/Bugg Spring facility's initial baseline inventory occurred in 2013. Monitoring of previously treated areas will continue annually to determine the effectiveness of the removal efforts.

Type: Mandatory

Legal Drivers: EO 13112 – Invasive Species.; Federal Noxious Weed Act of 1974, 7 U. S. C. 2801, Sec. 2814 (a); DOD Pest Management Program; Endangered Species Act, 16 U.S.C. 1531 et seq.; Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 7 U.S.C. 136; OPNAVINST 5090.1C, par 24-5.l, par 24-6.m, and par 24-7.j.

Project No. 2: Rare, Threatened, Endangered, and Protected Species Surveys

Purpose: Monitor the health and populations of protected plant and animal species present on the LEFAC/Bugg Spring facility and ensure compliance with Federal and state wildlife laws, regulations, and policies.

Goal(s) and Strategy: Goal - Protect and manage for the recovery of RTE species.

Management Strategies (Section 4.3.2.3) 1, 2, 3, 4, 5

Goal - Schedule appropriate surveys for RTE species found at LEFAC/Bugg Spring.

Management Strategies (Section 4.3.2.3,) 1 and 2

Goal - Educate installation personnel regarding sensitive species.

Management Strategy (Section 4.3.2.3) 5

Goal - Build interagency relationships with FWC, USFWS, and other entities, as appropriate, to ensure consistent and appropriate management of RTE species and their habitats.

Management Strategies (Section 4.3.2.3) 3 and 5

Location: LEFAC/Bugg Spring facility.

Description: This project will update inventory and distribution data on RTE and protected species and their habitats on the LEFAC/Bugg Spring facility. Surveys will include RTE plant and animal species and important habitats. Surveys and inventories will analyze the health and numbers of individuals and assist with the identification of wildlife indicators throughout the property. Species inventories are essential in the development of management plans to implement the INRMP and to comply with Federal and state laws.

Baseline: Surveys conducted in 2012, 2013, and 2014.

Monitoring: Monitoring will be conducted as funding permits.

Type: Mandatory

Legal Drivers: Endangered Species Act, 16 U.S.C. 1531 et seq.; Natural Resources Management Program, 32 C.F.R. 190.

Related Legal: Sikes Act, as amended 16 USC 670 a-o; Migratory Bird Treaty Act, as amended, 16 U.S.C. 703 et seq.; Fish and Wildlife Conservation Act, 16 U.S.C. 2901; OPNAVINST 5090.1C, par 24-6.c, par 24-6.d, and par 24-6.g.

Project No. 3: Survey and Monitoring of Migratory Bird Species

Purpose: Determine which migratory bird species occur at the LEFAC/Bugg Spring facility and identify potential migratory bird management needs.

Goal(s) and Strategy: Goal - Conduct a breeding bird survey.

Management Strategy (Section 4.3.3.3) 1

Goal - Prevent loss of forested wetland and upland and maintain habitat quality while supporting the training mission.

Management Strategies (Section 4.3.3.3) 3 and 4

Goal - Maintain, or reestablish, where practicable, native ecosystems.
Management Strategies (Section 4.3.3.3) 2, 3 and 4

Location: LEFAC/Bugg Spring facility.

Description: This project provides for continued monitoring and protection of migratory birds on the LEFAC/Bugg Spring facility using a point

count survey method. Vegetation descriptions will be collected at each point to track any changes in habitat that might relate to observed avifauna.

Baseline: Existing migratory bird surveys.

Monitoring: As funded.

Type: Mandatory

Legal Driver(s): Migratory Bird Treaty Act, 16 U.S.C. 703; Natural Resources Management Program, 32 C.F.R. 190.

Related Legal: Fish and Wildlife Conservation Act, 16 U.S.C. 2901; Endangered Species Act, 16 U.S.C. 1531 et seq.; DOD 4715, Sikes Act, as amended, 16 U.S.C. 670 a-o; OPNAVINST 5090.1C, par 24-6.h.

Project No. 4: Revegetate Citrus Orchard

Purpose: Remove existing abandoned citrus trees and manage plant succession to benefit gopher tortoises and other native species. This effort will result in the development of a more biologically diverse and wildlife-friendly ecosystem than what is currently in place.

Goal(s) and Strategy: Goal - Encourage establishment and growth of native plant communities to benefit gopher tortoise and other species.

Management Strategy (Section 4.1.4.3) 1

Location: Abandoned Citrus Orchard located on LEFAC/Bugg Spring facility.

Description: Removal of existing citrus trees and periodic mechanical disturbance of vegetation to prevent encroachment of woody vegetation and encourage the robust growth of forbs.

Baseline: Abandoned citrus orchard

Monitoring: Monitoring of birds, RTE species, and invasive plant species to evaluate the presence and growth of native species and ecosystems.

Type: Stewardship

Legal Driver(s): Sikes Act

Mission Support: Grass understory and forbs are beneficial to many native species (e.g., gopher tortoise, indigo snake). Revegetation of the abandoned citrus orchard will reduce encroachment by invasive plants and produce savings in land management cost and improved ecosystem benefits when compared to alternative management options such as conversion to ornamental grass or unmanaged revegetation.

Project No. 5: Aquatic Invasive and Exotic Species Control

Purpose: Reduce invasive fish and aquatic animal species at the LEFAC/Bugg Spring facility to acceptable levels to promote native ecosystems.

Goal(s) and Strategy: Goal - Maintain or enhance biological diversity.

Management Strategies (Section 4.3.4.3) 1, 2, 3, and 4

Goal - Conserve wetlands, floodplains, stream and lake riparian areas, and soils.
Management Strategy (Section 4.3.4.3) 2

Goal - Avoid introduction of invasive aquatic species.
Management Strategies (Section 4.3.4.3) 2 and 4.

Goal - Control blue tilapia and suckermouth catfish in the sinkhole lake and spring-run stream.

Management Strategies (Section 4.3.4.3) 2 and 3

Location: LEFAC/Bugg Spring Facility

Description: The following items are some of the primary tasks to be accomplished by in-house personnel and contractors at the LEFAC/Bugg Spring facility for this project:

1) Provide control of exotic and invasive fish species.
2) Survey the site to identify locations and types of species for which control is feasible and practical. Control strategies will be developed for each target species to include the use of harassment techniques, physical removal, chemical control, and biological agents.

Exotic fish species such as tilapia and suckermouth catfish are abundant throughout the spring and can disrupt the native aquatic environment.

Baseline: Baseline will be established during initial project surveys.

Monitoring: This project will provide the monitoring necessary for the evaluation and removal of invasive and exotic aquatic species when present.

Type: Stewardship

Legal Drivers: Executive Order (EO) 13112 – *Invasive Species*.

Related Legal: DoD Pest Management Program; Endangered Species Act, 16 U.S.C. 1531 et seq.; Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 7 U.S.C. 136; OPNAVINST 5090.1C, par 24-5.l, par 24-6.m, and par 24-7.j.

Project No. 6: LEFAC/Bugg Spring Facility INRMP Updates

Purpose: To review and update the INRMP.

Goal(s) and Strategy: Goal - Maintain an up-to-date INRMP that accurately reflects current conditions.

Management Strategy (Section 4.5.3.3) 1

Location: LEFAC/Bugg Spring facility

Description: In accordance with OPNAVINST5090.1C par 24-5.c, the INRMP will be reviewed on a yearly basis and re-approved every 5 years. The review process will take into account changes in military mission requirements and legal mandates and information obtained from monitoring programs and surveys. Revisions will be reviewed for consistency with the military mission, Federal and state laws, and the ecosystem management goals and objectives of the INRMP.

The revision process will be conducted under the direction of the NSA Orlando CO; revisions will require consultation with and approval by the NSA Orlando, NAVFAC Southeast Core, the Regional natural resources manager, USFWS, and FWC.

Baseline: Existing INRMP; current surveys.

Monitoring: NA

Type: Mandatory

Legal Driver(s): Sikes Act Improvement Act of 1997, 16 U.S.C. 670 et seq.; Executive Order 11990 – Protection of Wetlands; Executive Order 13112 – Invasive Species; Executive Order 12962 – Recreational Fisheries; Section 404 of the Federal Water Pollution Control Act (Clean Water Act), as amended, 33 U.S.C. 1251; DODINST 7310.5; OPNAVINST 5090.1C, par 24-5.c; USMC-MCO P5090

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