Final

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
NAVAL SUBMARINE BASE KINGS BAY
KINGS BAY, GEORGIA




2018 Update

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NAVAL SUBMARINE BASE KINGS BAY
KINGS BAY, GEORGIA
INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN (INRMP) - 2018 OPERATIONS AND EFFECT CONCURRENCE

The Sikes Act and Department of Defense instruction require that annual and 5-year operation and effect reviews of INRMPs occur with federal and state partners. Representatives of the Navy, U.S. Fish & Wildlife Service, Georgia Department of Natural Resources, and National Marine Fisheries Service are invited annually to participate in the yearly Naval Submarine Base Kings Bay INRMP and Natural Resources Metric review. The last operation and effect review of this INRMP was completed in November 2013. We have revised the installation INRMP with input from the signatory partners as part of the required 5-year review process. By signing below, the partners concur that the management actions prescribed in the INRMP and implemented will contribute to the conservation and rehabilitation of installation natural resources.

BRIAN LEPINE CAPT USN

Commanding Officer,
Naval Submarine Base Kings Bay

08 NOV 2018
Date

Natural Resources Manager,
Naval Submarine Base Kings Bay

10/29/2018
Date

U.S. Navy Regional Environmental Coordinator

10/9/2018
Date

Natural Resources Manager, Commander Navy Region SE

10/4/2018
Date

Donald W.

U.S. Fish and Wildlife Service

10/10/2018
Date

Georgia Department of Natural Resources

10-4-18
Date

National Marine Fisheries Service

10/29/18
Date

Executive Summary

ES.1 Type of Document

This is an Integrated Natural Resources Management Plan.

ES.2 Purpose of Document

The purpose of this document is to meet statutory requirements under the Sikes Act Improvement Amendment (SAIA), Public Law 105-85, Div. B. Title XXIX, Nov. 18, 1997, 111 Stat 2017-2019, 2020-2022. In November 1997, the Sikes Act, 16 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 integrated natural resources management plans 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. The Act mandates that all military installations prepare and implement an integrated natural resource management plan (INRMP) by November 17, 2001. The U.S. Department of the Navy prepared this INRMP in 2001 for the Naval Submarine Base Kings Bay, Kings Bay, Georgia (NSB Kings Bay) and has reviewed this INRMP annually since its preparation.

ES.3 Goals and Objectives of the INRMP

The goal of the INRMP is to implement an ecosystem-based conservation program that provides for the conservation and rehabilitation of natural resources in a manner consistent with the military mission; integrates and coordinates all natural resources; provides for sustainable multipurpose uses of natural resources; and provides public access for use of natural resources subject to safety and military security considerations. The INRMP covers a period of 10 years and receives annual reviews during that 10-year period. Four installation-wide ecosystem management goals and fourteen objectives have been identified for NSB Kings Bay. The objectives developed to implement each goal are related to a natural resources issue facing the installation. Following are the goals, issues, and objectives for NSB Kings Bay.

Goal 1 Protect, conserve and enhance the ecological value and diversity of natural resources through fostering knowledge of, and participation in, adaptive ecosystem management in support of the installation's mission.

Issue Plans and programs for maintaining and managing natural resources on NSB Kings Bay need to fully consider the interrelationships among resources on the installation and insuring no net loss of the military mission. Often in the past, existing programs and plans have frequently focused on the management of individual resources in accordance with Federal or state laws.

Objective 1.1: To incorporate the concept of ecosystem management into all planning and management processes.

Objective 1.2: To implement training, education and stewardship initiatives for ecosystem management.

Objective 1.3: To establish a planning team to review and update the INRMP in accordance with OPNAV M-5090.1D 12-3.4.

Goal 2 Protect and maintain the NSB Kings Bay ecosystem through the continuation and enhancement of ecologically appropriate and beneficial land management practices, while ensuring the expansion and continuation of the military mission.

Issue As development and training activities have greater potential to affect a greater amount of the land area on NSB Kings Bay, land management decisions and practices will become increasingly important aspects of ecosystem management. The use and management of lands for military mission needs, and the decision-making process regarding such land use, directly affect the sustainability of the ecosystem.

Objective 2.1 To reduce and/or remove exotic and/or nuisance wildlife; and to control wildlife diseases that may adversely affect human health or welfare, the health of the ecosystem, or the military mission.

Objective 2.2 To continue existing and to establish new programs and procedures to maintain and enhance water quality.

Objective 2.3 To maintain the attenuation capacity of the remaining undisturbed acreage within the 100-year floodplain.

Objective 2.4 To continue to implement environmentally beneficial landscaping by reducing the need for irrigation, pesticides, and fertilizers.

Objective 2.5 To minimize adverse impacts to the natural environment when using lands in support of the military mission.

Objective 2.6 To evaluate the changing installation mission and integrating the changes into the planning process for natural resources management.

Goal 3 Protect, maintain, utilize and restore natural resources.

Issue On NSB Kings Bay, as in the surrounding region, human activities have effectively removed the native vegetative communities, including the longleaf pine forest community. As a result of the population and economic growth of the region, environmental resources on the installation will provide vital habitat for birds and terrestrial vertebrates. Because of this, the installation would need to implement, and enforce appropriate protective measures to ensure the protection of these habitats. If not protected, this area could become intensely developed and natural habitat would be lost.

Objective 3.1 To maintain ecological integrity by ensuring the long-term viability of native wetland and upland biological communities for the protection of all wildlife.

Objective 3.2 NSB Kings Bay will conserve and manage threatened and endangered species and species of concern with a goal of no reduction in species numbers or population sizes.

Objective 3.3 NSB Kings Bay will utilize effective management techniques to sustain essential habitat and populations of fish and game species.

Objective 3.4 NSB Kings Bay will enhance, protect and conserve installation freshwater fishery resources.

Goal 4 Provision of facilities and development of policies that allow for passive, recreational uses and environmental education activities that will not adversely affect the natural areas, nor conflict with the military mission or security needs.

Issue The SAIA requires that military installations evaluate the potential for providing outdoor recreational resources to the general public. Current access to most of the NSB Kings Bay's existing recreational resources is limited to installation DoD civilians, uniformed military person and dependents, and retired military personnel. NSB Kings Bay currently has shared recreational opportunities with the general public in the northwestern portions of the installation.

Objective 4.1 To continue to address the long-term recreational needs of NSB Kings Bay, and NSB Kings Bay's capability to provide recreational and educational opportunities to the public and installation personnel.

Objective 4.2 To develop and maintain recreational facilities and trails and/or interpretive centers to support the NSB Kings Bay population.

To ensure success in achieving these goals and objectives a framework or "road map" of strategies, projects, and other management initiatives are discussed in the INRMP.

ES.4 Functional Areas and Management Focuses

To achieve installation-wide goals and objectives the installation has been divided into functional areas. Functional areas reflect the use of the area for its military purpose, and the potential for natural resources management. Within each functional area, natural resources management focuses are identified. The management focus for an area may include: land management, forestry, fish and wildlife, and outdoor recreation. A management focus includes the primary practices necessary to achieve the long-term goals and objectives of the INRMP.

Based on the location of military uses on NSB Kings Bay and the availability and sustainability of natural resources, property, NSB Kings Bay is divided into seven functional areas: MU-1, MU-2, OP-1, OP-2, OP-3, P-1 and P-2 (Figure 7-1).

- *Protected areas (P)* include land protected due to the unique natural, cultural or aesthetic value.
- *Operational Protected areas (OP)* include areas vital to the continuance of the military mission.
- *Mixed Use areas (MU)* include areas where non-timber values such as wildlife habitat, water quality (wetland, stormwater and floodplains protection), recreational potential or urban management is the bases for management decisions.

ES.5 Species Management

The natural resource actions described in this INRMP are for the benefit of the plants, animals, and ecosystems occurring on this installation. Special attention is given to rare, threatened, and endangered (RTE) species, and their habitats, through management actions referenced in Table ES-1. These actions are long-term conservation measures that provide benefits for terrestrial and aquatic habitats on the installation. Management actions such as soil conservation and storm water management, for example, control sediment and pollutant runoff to protect nearshore water quality for species such as manatees, shorebirds, and fish. Forestry actions such as prescribed burning, thinning, and reforestation help to establish longleaf pine stands and herbaceous low-lying vegetation that provide habitat and resources for gopher tortoises, as another example.

Table ES-1. Habitat Management Actions at NSB Kings Bay, Georgia.

Habitat Management Actions	Section
Wetland Management	4.3.1.1
Soil Conservation & Erosion Control	4.3.1.2
Stormwater & Water Quality Control	4.3.1.3
Landscaping, Grounds Maint., and Urban Forestry	4.3.1.4
Floodplain Management	4.3.1.5
Integrated Pest Management	4.3.1.6
Stand Improvement (i.e. prescribed burns and thinnings)	4.3.2.1
Land Treatment Area Forests	4.3.2.2
Reforestation	4.3.2.3
Forest Disease and Insect Protection	4.3.2.4
Habitat Enhancement (for fish and wildlife)	4.3.3.1
Threatened and Endangered Species Protection	4.3.3.2
Game Wildlife Management	4.3.3.3
Prevention & Control of Wildlife Damage and Disease	4.3.3.4
Freshwater Fisheries	4.3.3.5
Outdoor Recreation	4.3.4

The Fish and Wildlife Management section of this INRMP (Section 4.3.3.2) includes additional goals, objectives, strategies, and projects for the benefit and long-term conservation of RTE species found, or potentially found, on the installation. RTE animal and plant species explicitly accounted for in this INRMP are:

- Atlantic Sturgeon (fish)
- Ball Moss (epiphyte)
- Bartram's Air Plant (epiphyte)
- Eastern Diamondback Rattlesnake
- Eastern Indigo Snake
- Fox Squirrel
- Giant Manta Ray (fish)
- Green-fly Orchid (epiphyte)
- Gopher Frog
- Gopher Tortoise
- Hooded Pitcher Plant
- Least Tern (bird)
- Monarch Butterfly
- North Atlantic Right Whale
- Painted Bunting (bird)
- Pond Spice (shrub)
- Red Knot (bird)
- Sea Turtles:
  - Green Sea Turtle
  - Hawksbill Sea Turtle
  - Kemp's Ridley Sea Turtle
  - Leatherback Sea Turtle
  - Loggerhead Sea Turtle
- Shortnose Sturgeon (fish)
- Smalltooth Sawfish
- Southern Hog-nosed Snake
- Spotted Turtle
- Striped Newt
- Tiny-leaf Buckthorn (shrub)
- West Indian Manatee
- Wood Stork

ES.6 Projects of the INRMP

Projects are discrete actions for fulfilling a particular strategy. Projects may be required in order for NSB Kings Bay to fulfill regulatory requirements regarding natural resources management, or in order to enhance existing measures for ensuring compliance. Projects of the INRMP are shown in Tables ES-2.

Funding for implementation of the INRMP will come from the Installation, forestry outleasing, Navy Installations Command (CNIC), or Naval Facilities Engineering Command (CNEC) natural resources fund sources. 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 O & M (N) Environmental, or other funding to implement DoD mandatory projects, in the timeliest manner possible. Stewardship-type projects will be funded through forestry, agricultural outlease, fish and wildlife, Legacy, or other fund sources as funding and personnel resources become available.

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1 Introduction

1.1 Purpose and Organization

The purpose of this document is to meet statutory requirements under the Sikes Act Improvement Amendment (SAIA), Public Law 105-85, Div. B. Title XXIX, Nov. 18, 1997, 111 Stat 2017-2019, 2020-2022. In November 1997, the Sikes Act, 16 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 integrated natural resources management plans 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. The Act mandates that all military installations prepare and implement an Integrated Natural Resource Management Plan (INRMP) by November 17, 2001. INRMP reviews are coordinated annually with the U.S. Fish and Wildlife Service (USFWS) and the states. INRMP updates are conducted every 5 years as necessary.

The U.S. Department of the Navy (DoN) prepared this INRMP for the Naval Submarine Base Kings Bay, Kings Bay, Georgia (hereinafter identified as NSB Kings Bay) in 2001, to comply with the SAIA and with Department of Defense (DoD) Instruction (DoDINST 4715.3). This INRMP also complies with the Office of the Chief of Naval Operations Environmental Readiness Program Manual (OPNAV M-5090.1D), Chapter 12, ASN (I&E) Memorandum of 12 August 1998, OUSD Memorandum of 21 September 1998, CNRltr Ser N45D/8U589016 of 25 September 1998, and Chief of Naval Operations (CNO) ltr Ser N456F/8U589129 of 30 November 1998. The INRMP has been reviewed annually since 2001, and updated in 2006.

Other than the mandated requirement, the primary purpose of the INRMP is to provide NSB Kings Bay with a foundation from which to manage the installation's natural resources in support of the military mission. The INRMP will outline the management of the installation's natural resources for the next 10 years. The INRMP will account for the goals of the natural resources program within those 10 years, while insuring no net loss of mission capability.

The INRMP will also consider the surrounding natural resources through implementation of an integrated approach to management.

The first three sections of this INRMP establish the existing conditions at NSB Kings Bay. Section 1 provides a general overview of the purpose and intent of the INRMP and processes for review, implementation, and revision of the plan. Section 2 establishes the importance of the military mission within the DoN; discusses the organization of the installation; provides a brief overview of the natural resources program; and identifies installation partnerships and stakeholders with a particular interest in the protection of installation and regional natural resources. Section 3 discusses the existing physical and biological characteristics of the local and regional environment. Physical characteristics include climate, topography, geology, soils, hydrology, groundwater, and land use. Biological characteristics include wetlands, threatened and endangered species, coastal zone issues, fisheries and natural vegetative communities.

The remaining sections of the INRMP identify issues pertaining to the long-term management of NSB Kings Bay's natural resources and land management programs and practices for achieving desired conditions. Section 4 discusses ecosystem management goals, objectives, strategies, initiatives, and/or projects that comprise a logical sequence of actions for achieving the long-range aim of ecosystem management.

Section 5 discusses the environmental planning and mission suitability. Military mission components are addressed and encroachment areas of concern are identified. Section 5 also includes both an evaluation of impacts to the military mission from natural resource management and the impacts of natural resources management on the military mission.

Section 6 describes the projects that are proposed for implementation by NSB Kings Bay. Projects were identified by the NSB Kings Bay Natural Resources Manager in consultation with foresters, fish and wildlife biologists, and soil conservationists with the Land Management Department of Southern Division, as well as with Federal, state, and county wildlife biologists, foresters, and land managers. For each project, Section 6 discusses the purpose, location, description, cost, relevance to the goals and objectives listed in Section 4, baselines, and monitoring and legal requirements. It is the intent of NSB Kings Bay to implement the projects as described in Section 6 to the greatest extent possible. However, the implementation of projects is largely dependent upon the availability of funds, NSB Kings Bay's military mission and the installation's available staffing.

Section 7 discusses the natural resources management focus areas, including land management, forestry management, fish and wildlife management, and outdoor recreation. Management focus areas were developed for no net loss in capability of lands to support the military mission and to achieve the goals, objections, and strategies discussed in Section 4. The management focus for an area defines the primary purpose for the land. All other long-term management practices will be implemented in support of the primary purpose.

1.2 Ecosystem Management

In November 1997, the Sikes Act, 16 U.S.C. 670 § a et seq., was amended to require the implementation of a program to provide for the conservation and rehabilitation of natural resources on military installations. The Navy's approach for management of natural resources is holistic in that it incorporates an awareness of the broad regional setting in which the installation is located. Appropriate and effective management of natural resources on Navy lands will be achieved in accordance with the principles and practices of ecosystem management.

Ecosystems are important components of environmental systems (Levine 1991). Ecosystem components, living and non-living, are linked together by numerous flows of matter and energy (Levine 1991). Ecosystems involve repetitive or cyclic phenomena and typically contain a great diversity and number of species, individual organisms, and abiotic components. The living members of ecosystems exhibit a wide array of behaviors, and intra- and interspecies interactions are varied and often subtle. Recognizing that crucial interdependencies exist within and between ecosystem components is important in establishing successful environmental management policies.

Ecosystem management is the centerpiece of environmental policy in the late 20th and early 21st centuries and is a unifying approach for the management of military lands. Ecosystem management's broad-based approach to natural resource management involves identifying, protecting, and restoring complete ecosystems — including abiotic structural components and natural processes — while fully incorporating social, economic, and other human concerns into planning (DoD 1996).

1.3 Military Mission

The mission of the Navy is to maintain, train and equip combat-ready Naval forces capable of winning wars, deterring aggression and maintaining freedom of the seas. The mission of NSB Kings Bay is to provide support to the Fleet, Fighter, and Family.

1.4 Goals of the Integrated Natural Resource Management Plan (INRMP)

The INRMP is a management-planning document that establishes a guideline for the use and conservation of natural resources on lands and water under DoD control. Currently, DoD is one of the largest landholders in the U.S, with more than 20 million acres. Some of the most environmentally sensitive properties, including sensitive species and/or sensitive vegetative communities, occur within these lands.

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. The military's use of land and water resources must comply with legal mandates and will, to the extent practicable, be integrated with ecosystem-level goals, plans, and use of lands and waters inside and outside the boundaries of military installations.

As an essential, initial part of the INRMP process, the subject DoD installation develops a natural resources mission statement. The mission statement provides the standard by which to measure the effects and effectiveness of INRMP decisions. The mission statement for the Natural Resources and Conservation Program follows.

Mission Statement of the Natural Resources and Conservation Program at Naval Submarine Base, Kings Bay, Georgia:

"Provide comprehensive ecosystem-based management of the natural resources at Naval Submarine Base Kings Bay, to protect and enhance the environment for future generations and contribute to the quality of life for current military and civilian residents of southeast Georgia." This mission will be in support of the installation's military mission.

1.5 Implementation of the INRMP

Implementation of the INRMP will follow an annual strategy that includes annual review meetings.

1.5.1 Legal Requirements

Legal requirements are laws, executive orders, regulations, directives, and memoranda regarding the protection and management of natural resources. The INRMP will be updated as legal requirements change. Relevant legal requirements for natural resources management are presented throughout Section 4.

1.5.2 Funding

Funding for implementation of the INRMP will come from the Installation, CNIC, or Naval Facilities Engineering Command natural resources fund sources. 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 operation and maintenance, Navy [O & M(N)] Environmental, or other funding to implement DoD mandatory projects, in the timeliest

manner possible. Stewardship-type projects will be funded through forestry, agricultural outlease, fish and wildlife, Legacy, or other fund sources as funding and personnel resources become available.

1.5.3 Implementation Responsibilities

NSB Kings Bay's Commanding Officer (CO) is responsible for managing all aspects of the installation's natural resources. The CO has delegated to an Environmental Director within the Environmental Department the authority to implement natural resources management activities through the installation's Natural Resources Manager. Other installation personnel, such as: Security; Grounds Maintenance; Morale, Welfare and Recreation (MWR); Housing; and Safety, have functions overlapping the natural resources program, but report to the Environmental Director on natural resources-related issues. The Sikes Act requires a qualified professional to implement environmental management programs.

1.5.4 Technical Assistance

Technical assistance to NSB Kings Bay may be provided from within the DoN or by outside agencies. Assistance from outside agencies is normally provided through individual agency requests and formal cooperative agreements, while assistance from within DoN is normally less formal. During the 10-year management period of this INRMP, additional cooperative agreements may be implemented.

Technical assistance from organizations outside the DoN may include:

- The USFWS, the Georgia Department of Natural Resources (GDNR), and the Georgia Natural Heritage Program (GNHP) under a Cooperative Agreement among the DoN, the U.S. Department of the Interior (USDOI), and the State of Georgia.
- The Nature Conservancy (TNC) under a Cooperative Agreement between DoD, GNHP, and TNC; and
- Other government agencies, such as the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), Animal and Plant Health Inspection Service (APHIS) Wildlife Services, USDA Forest Service (USFS); USDOI National Parks Service (NPS), and the Georgia Forestry Commission.

Technical assistance from within DoN will be provided by:

- The NSB Kings Bay Natural Resources and Environmental Department managers;
- Foresters, fish and wildlife biologists, and soil conservationists from the Land Management Department of Southern Division Naval Facilities Engineering Command (Southern Division); and
- Additional staff, as needed and subject to funding, to be hired by the NSB Kings Bay Command in order to complete the continuous work for successful implementation of the INRMP.

1.5.5 Labor Resources

Options for supplemental labor resources from outside the DoN for implementation of the INRMP include volunteers from local organizations and groups such as:

- Scout troops;
- Elementary, middle, or high school students;
- College students;
- Ecology clubs and conservation programs/groups (*e.g.*, the Student Conservation Association);
- Businesses/Homeowners' associations; and
- Retired/senior citizens.

Options for supplemental labor resources from within the installation include the Natural Resources Manager, Environmental Department, and volunteer civilian and military personnel, and their dependents.

1.6 Approval, Function, Use, and Revision Process of the INRMP

1.6.1 Approval of the INRMP

The INRMP is required to be signature-endorsed by the subject installation's CO, the installation's Natural Resources Manager, the Regional Environmental Coordinator, the Southern Division Natural Resources Manager, the USFWS and the GDNR. According to the SAIA, the INRMP must reflect mutual agreement with the USFWS and the GDNR. Mutual agreement will concern conservation, protection, and management of fish and wildlife resources, and will be represented by the signing of the appropriate agency representatives.

1.6.2 Function and Use of the INRMP

The INRMP will outline the management of the installation's natural resources for the next 10 years. To accomplish this, the INRMP presents long-term management concepts for the installation that are consistent with the management of natural resources and fulfillment of the installation's military mission. The long-term management concepts do not represent any incremental or specific approach to management, but rather to provide a philosophy and direction for the Natural Resources Manager and DoN decision-makers to ensure long-term sustainability of natural resources. It is not necessarily the function of the INRMP to define specific projects for specific locations, nor to

define specific practices or schedules for the individual components of natural resources management, which include land management, forestry, fish and wildlife, and outdoor recreation.

Specific practices and schedules are addressed in existing management plans and programs developed for the installation, including, but not limited to, grounds maintenance and stormwater pollution and prevention. These plans and programs adhere to Federal and state regulatory requirements and will be utilized as tools for implementing this plan. These plans are dynamic, updated annually, and will be inclusive of the goals and objectives identified in this INRMP.

1.6.3 Revision Process

In accordance with OPNAV M-5090.1D 12-3.4, the INRMP will be reviewed on a yearly basis and re-approved every 5 years, with updates as necessary. The review process will take into account changes in military mission requirements, 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 installation CO. Revisions will require consultation with and approval by the installation CO, the Regional Environmental Coordinator, the installation Natural Resources Manager, NAVFAC Southeast, the USFWS, and the GDNR.

1.7 Elements of the INRMP Addressed

1.7.1 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act of 1996 (MSFCMA) requires that the National Marine Fisheries Service (NMFS), the regional fishery management councils, and the Secretary of Commerce describe and identify essential fish habitat (EFH) for important marine and anadromous fish habitat for 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 to where the salt-water influence subsides.

The MSFCMA requires Federal agencies to consult with NMFS when any activity proposed to be permitted, funded, or undertaken by a Federal agency may have adverse impacts on designated EFHs. Impacts on EFHs were considered when preparing this document, and would not be expected to adversely affect EFHs. However, implementation of the INRMP would be expected to improve water quality and estuarine and marine habitats.

1.7.2 Coral Reefs

In accordance with Executive Order (EO) 13089, Coral Reef Protection of 11 June 1998, which requires Federal agencies to protect and enhance coral reefs and coral reef systems, the DoN recognizes that coral reefs and related endemic mangrove and sea grass ecosystems are biologically rich and diverse habitats. There are no coral reef systems within the area of influence of this INRMP.

1.7.3 Clean Water Action Plan

The Clean Water Action Plan (CWAP) focuses on watersheds with the most critical water quality problems and takes a cooperative approach to developing and implementing effective strategies to solve those problems. Unified watershed assessments (UWAs) provide the foundation for this approach to restoring and protecting water quality and are vehicles to identify:

- Watersheds that will be targeted to receive new resources to clean up waters that are not meeting water quality goals;
- Pristine or sensitive watersheds on Federal lands where core Federal and state programs can be brought together to prevent degradation of water quality; and
- Threatened watersheds that need an extra measure of protection and attention.

NSB Kings Bay watershed is not designated as a watershed with a critical water quality problem. However, implementation of the INRMP would be expected to contribute to improved water quality within the watershed.

1.7.4 Bird Air Strike Hazard Reduction

A Bird Air Strike Hazard Reduction (BASH) management plan is not required for NSB Kings Bay because of the absence of air operations requiring a management program.

1.7.5 Critical Habitat

Section 1532 (5) (A) of the Endangered Species Act defines critical habitat for threatened or endangered species. Waters to the east of Cumberland Island have been designated as critical habitat for the North Atlantic right whale (*Eubalaena glacialis*). Additional information on the critical habitat and management efforts of the North Atlantic right whale are addressed in Section 4.3.3.2.

1.7.6 Public Access

NSB Kings Bay uniformed military personnel and dependents, retired military personnel, and DoD civilians (hereinafter, this group is referred to as DoD personnel) are allowed to bring a maximum of two guests on the installation at a time to participate in all outdoor activities (see Section 3.9.1). Public access is allowed to Etowah Park and the housing area in the northwestern portions of

NSB Kings Bay. All guests on the installation are to adhere to the same rules and regulations that oversee the outdoor recreational activities located within the installation boundaries. For future activities, the installation will carefully consider providing increased public access that is consistent with the military mission.

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2 History and Organization

2.1 Location and History

Navy and Marine Corps activities are the predominant Department of Defense (DOD) presence (95 percent) in the Jacksonville region, where the Navy has three major installations (Figure 2-1):

- Naval Station Mayport (at the juncture of the St. Johns River and the Atlantic Ocean)
- Naval Air Station Jacksonville (southwest sector of Duval County, west of the St. Johns River)
- Naval Submarine Base Kings Bay (southeastern section of Camden County, Georgia)

With more than 36,000 military and civilian personnel, 19 ships, 7 submarines, 10 fixed-wing and 8 helicopter squadrons, the Jacksonville Fleet Concentration Area has the third-largest concentration of Navy activities in the continental United States. The area, which is strategically located with respect to Europe and the Caribbean, comprises the Atlantic Coastal area from Camden County, Georgia, in the north to the Ocala National Forest in the south.

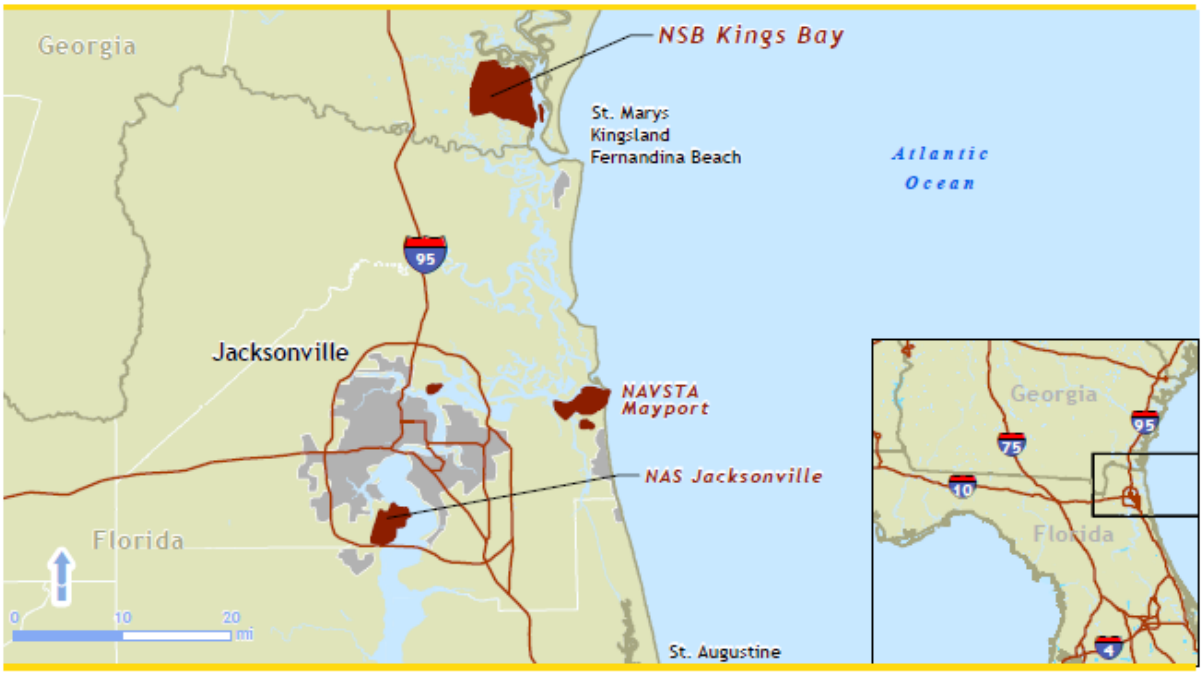

Figure 2-1. Proximity Map of Naval Submarine Base (NSB) Kings Bay, Georgia.

Prior to military presence, the area currently occupied by NSB Kings Bay was the site of several plantations where crops such as cotton and sugar cane were grown. Before the plantations the area was occupied by aboriginal, Spanish, and British populations. Figure 2-2 shows highlights from the base's beginnings.

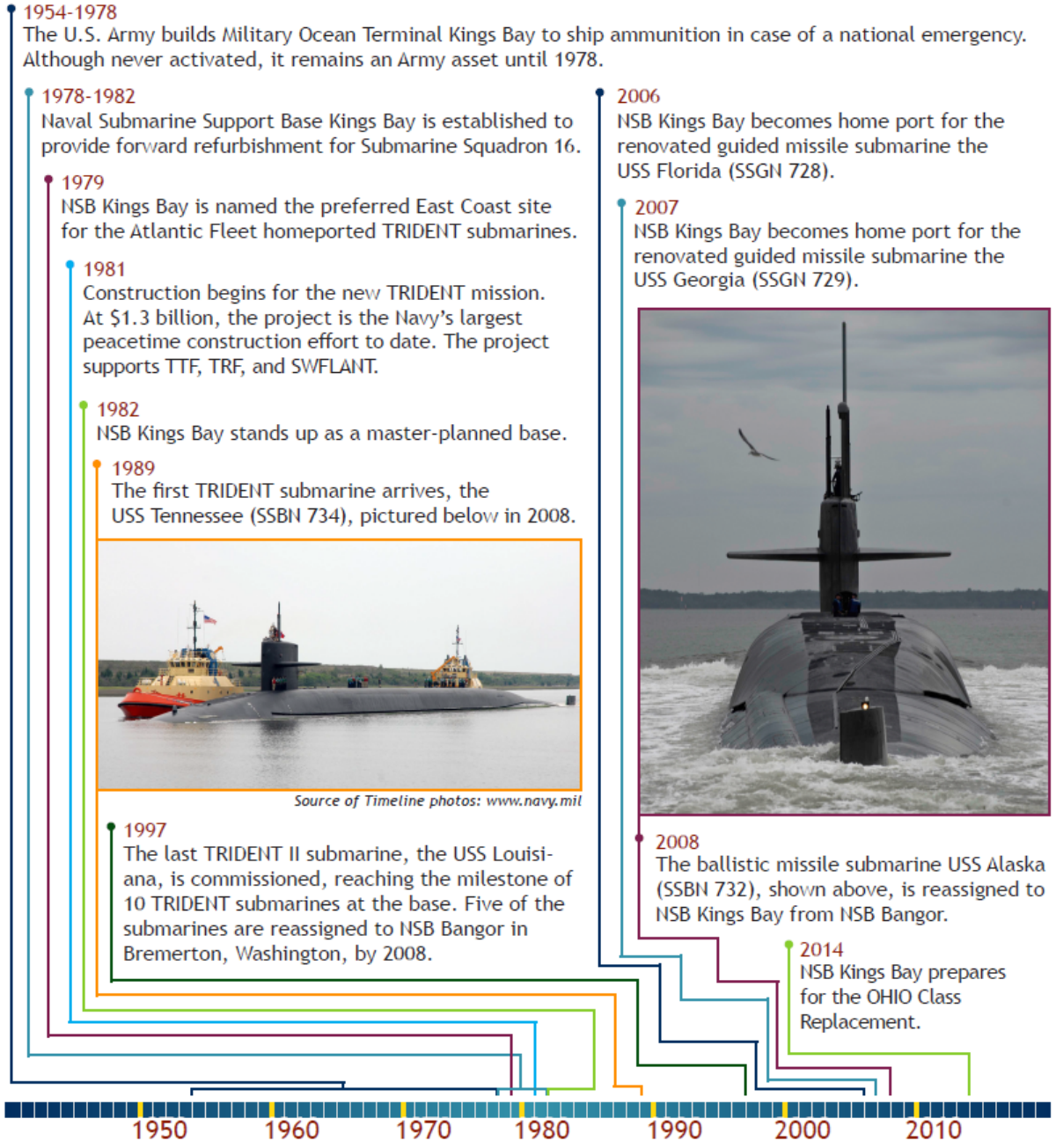

Figure 2-2. Timeline Depicting the History of Naval Submarine (NSB) Base Kings Bay, Georgia.

2.2 Organization and Structure

NSB Kings Bay is home to approximately 60 tenants. Major tenants and their missions are summarized in this section.

COMSUBGRU 10

Submarine Group 10 (COMSUBGRU 10) is the senior commander at NSB Kings Bay. It exercises command and control over various commands and units assigned, including operational and administrative control of the OHIO Class ballistic missile submarines and guided missile submarines based at NSB Kings Bay. COMSUBGRU 10 is the local coordinating authority for all matters assigned by the submarine force commander and exercises direct control over the administration and training of submarine off-crews at NSB Kings Bay. Proper integration and coordination of the facilities dedicated to training support of the TRIDENT system are specifically included in these responsibilities.

Submarine squadrons 16 and 20, along with the Nuclear Regional Maintenance Department (NRMD), Trident Refit Facility (TRF), and the Naval Submarine Support Center (NSSC), are subordinate commands under COMSUBGRU 10.

- Submarine Squadron 16 (SUBRON 16) commands the SSGNs, USS Florida, and USS Georgia.
- Submarine Squadron 20 (SUBRON 20) commands the SSBNs, USS Alaska, USS West Virginia, USS Maryland, USS Rhode Island, USS Wyoming, and USS Tennessee.
- The NRMD is responsible for the planning and coordination of all repairs on nuclear machinery, components, and associated systems. NRMD develops and enforces performance standards for nuclear production work, provides emergency response for reactor accidents, and assumes first-responder responsibilities and maintains a watch bill for the Commander, Navy Region Southeast.
- TRF provides industrial and logistics support for the incremental overhaul, modernization, and repair of TRIDENT submarines and global submarine supply support. The command also provides maintenance and support services to other submarines, regional maintenance customers, and other activities as requested. The TRF provides support to the eight submarines at NSB Kings Bay and two others at Diego Garcia in the Indian Ocean.
- NSSC provides centralized administrative and support services to local submarine squadron commanders, assisting them with materiel, personnel, training, and logistics of assigned and visiting submarines.

SWFLANT

Strategic Weapons Facility Atlantic (SWFLANT) provides strategic missiles and strategic weapons system support to the ballistic missile submarine (SSBN) fleet. It also provides support for recently-reconfigured guided missile submarines, which can carry Tomahawk Cruise Missiles. SWFLANT is responsible for assembling the D5 missile and processing missile guidance and launcher subsystem components. SWFLANT's mission is supported by the security services of the Marine Corps Security Force Battalion and escort services of the Maritime Force Protection Unit (MFPU).

TTF

Trident Training Facility (TTF), with over 520,000 square feet of classroom and office space, trains officers and enlisted personnel in the basic knowledge and skills required to build proficiency in operating and maintaining TRIDENT ballistic missile submarines, guided missile submarines, and submarine systems. The TTF provides advanced, off-crew, and team training to submarine crews and support personnel to increase and maintain knowledge and proficiency in specific skills. TTF also has the ability to provide specialized training as directed by higher authority.

2.3 Overview of Natural Resources Management

NSB Kings Bay is responsible for funding, preparing, and implementing all aspects of the management of its natural resources. NSB Kings Bay's CO is the responsible steward, and all parties are encouraged to work together to comply with laws and regulations to enable the protection of the overall resources. As the responsible party for the natural resources on NSB Kings Bay, the CO has delegated implementation authority for natural resources-management activities to the Natural Resources Manager in the Environmental Department. To facilitate the implementation of the natural resources program on NSB Kings Bay, the Natural Resources staff prepares instructions, which delegate various natural resources responsibilities to other installation personnel, such as Security, Recreation, Grounds Management, Housing, and Safety. Specific responsibilities are as follows:

- Security personnel are trained and utilized as game wardens to ensure that all laws, rules, and regulations are adhered to in hunting and fishing areas;
- Morale, Welfare, and Recreation (MWR) personnel are responsible for designing and conducting natural resource-dependent recreational programs within the framework of this plan;
- Grounds Maintenance personnel are responsible for designing and conducting activities concerning grounds maintenance, landscape, litter control, pest management and other related activities;

- Housing personnel work with tenants to encourage them to take pride in developing and maintaining individual landscapes and the general appearance of the housing area; and
- Safety personnel are responsible for general oversight of safety programs and initiatives.

NSB Kings Bay natural resources program has received numerous awards for natural resources achievement. Notable projects include the ongoing Manatee Conservation Program, the creation of 16 acres of salt marsh mitigation area, and receipt of the DoD Environmental Landscape for Federal Facilities Award.

2.4 Stakeholders and Partnerships

Stakeholders are those organizations or individuals who have a vested interest in land management on the installation. Over the past several years, NSB Kings Bay has developed partnerships and cooperative agreements with the stakeholders and other entities interested in participating in activities on NSB Kings Bay. NSB Kings Bay recognizes that it is important to participate with the surrounding community and to maintain communication between the installation and the community. In addition, these efforts complement its overall philosophy of actively partnering with, and sharing information and resources with other resource management agencies and organizations, including Federal, state, or local government agencies, and non-governmental organizations.

Other potential partnerships would include organizations such as the Girl Scouts and Boy Scouts of America to plant trees, clear brush for nature trails, and participate in overnight camping sessions. NSB Kings Bay participates in cooperative agreements with fish and wildlife biologists from the USFWS, GDNR, and the National Park Service. Other local partnerships include the Cumberland Island National Seashore and Crooked River State Park.

2.5 Plans, Programs, and Studies

2.5.1 Stormwater Plan

Stormwater is managed in accordance with the NSB Kings Bay Stormwater Pollution Prevention Plan (SWPPP; SUBASE 2014). The pollution prevention approach of the SWPPP focuses on three major objectives: 1) identification of pollution sources; 2) minimization and control of stormwater pollutants; and 3) ensuring compliance with permit conditions. The SWPPP is managed by an Environmental Engineer in the Environmental Department, who works in concert with the Natural Resources Manager on related issues.

The SWPPP has three major components for industrial areas: stormwater monitoring, site compliance evaluation, and the implementation of best management practices (BMPs). The SWPPP divides the installation into four drainage basins; industrial activities occur in three of them. Stormwater runoff from NSB Kings Bay drains primarily into four waterways: north to Marianna Creek, south to North River, east to Mill Creek, or east directly into Kings Bay. The majority of runoff flows to the North River; the North River joins the St. Marys River, and ultimately discharges into the Atlantic Ocean through the Cumberland Sound.

2.5.2 Hazardous Waste Plans

NSB Kings Bay implemented the minimization and control of hazardous waste as the primary hazardous waste management strategy. To achieve this, NSB Kings Bay has implemented an Oil Spill Prevention Control and Countermeasures (SPCC) plan and a Hazardous Waste Reduction Plan (HWRP).

Both the SPCC and HWRP are part of the process to ensure proper identification and management of high risk sites and wastes generated by NSB Kings Bay – to control and minimize the generation and risk of hazardous waste accidents. Each program is managed by environmental engineers and technicians in the Environmental Department, working in concert with the Natural Resources Manager on related issues.

2.5.3 Pest Management Plan

The objective of NSB Kings Bay's Integrated Pest Management (IPM) plan is to provide for pest control services using innovative alternatives to pesticides and herbicides as discussed in Section 4.3.1.6. These services include, but are not limited to, the following:

- Prolonging the life of structures through subterranean termite and nuisance pest control;
- Maintaining the safety and security of industrial and storage areas through weed control;
- Providing nuisance pest control to all buildings and housing areas to ensure good working and living environments;
- Controlling weeds and insect pests in all recreational and lawn areas;
- Providing control of mosquitoes, flies, and other potential vectors; and
- Providing vertebrate pest control, including rodent control, to all developed areas of the installation.

2.5.4 Landscaping/Grounds Maintenance Plan

The grounds maintenance program at NSB Kings Bay is managed by the installation's Public Works Department in accordance with the Landscape Master Plan (Laubmann-Reed & Associates, Inc., 1980). The Landscape Master Plan provides a framework for safe, efficient, and functional

development while complementing and reinforcing the unique coastal environment of the Kings Bay region. The overall approach is a naturalistic one, emphasizing existing natural landscape features, such as vegetation, water, and topography, as the central unifying elements, to enhance a harmonious and integrated aesthetic facility.

NSB Kings Bay manages all grounds maintenance activities under a contractual agreement, which states that the contractor will provide all necessary labor, supervision, equipment, and materials necessary to perform all maintenance activities for improved and semi-improved grounds. Maintenance activities include, but are not limited to, grass cutting, edging, and fertilizing; cultivation and mulching of shrubbery, hedgerows, and flowerbeds; tree and shrub pruning; raking; pest control; and vacuuming and sweeping of paved areas. The contractor is also responsible for the inspection, operation, and maintenance of all installation surface drainage systems and the irrigation system.

2.5.5 Freshwater Fishery

The University of Florida, in 2017, characterized the fish communities in three lakes on NSB Kings Bay – Stimson B, Stimson C, and Lake D – to assess the largemouth bass (*Micropterus salmoides*) populations and recommend management strategies. The three lakes appeared to provide high catch rates and opportunities for trophy fish, which are typical goals of recreational managers. The NSB Kings Bay largemouth bass fisheries were thriving at that time, and the survey concluded that further management intervention may not be needed (Slagle and Allen 2017).

2.5.6 Plant Surveys

Plant surveys were conducted at NSB Kings Bay in 1997 and 2004, but none have been completed in more than a decade. A formal rare plant survey, completed in 1997, concluded that 19 plant species of special concern existed across 118 populations on NSB Kings Bay (VSU 1997; Section 3.6.1). In addition, 11 distinct vegetative communities (Section 3.4.1) were identified on NSB Kings Bay. Another rare plant survey was performed in 2003-04 and identified six taxa classified as rare by GDNR spread across 98 populations (CZR Inc. 2004).

Woody invasive plants including Chinese tallow (*Triadica sebifera*), mimosa (*Albizia julibrissin*), and chinaberry (*Melia azedarach*) were observed on the installation during the 2003-04 surveys, as were herbaceous invasive plants such as torpedo grass (*Panicum repens*), Japanese honeysuckle (*Lonicera japonica*), and Cogon grass (*Imperata cylindrical*; CZR Inc. 2004). The same species were documented in 2017-18. Torpedo grass, in particular was wide-spread in 2018, found in almost every roadside ditch adjacent to managed lawn (Leonard et al. 2018).

The rare pond spice (*Litsea aestivalis*), which had been observed on NSB Kings Bay in 2003, was not located in 2018. However, previously-reported occurrences of hooded pitcher plant

(*Sarracenia minor* var. *minor*) were relocated in recently-burned pine flatwoods habitats. New locations of hooded pitcher plants were also documented, as well as the state-imperiled coastal plain palafoxia (*Palafoxia integrifolia*). Adverse management techniques such as ditching around digressional wetlands at NSB Kings Bay have resulted in altered hydrology and negative effects on wet flatwoods and seepage bog habitats. This has resulted in degraded habitats for fire-adapted plant species (Leonard et al. 2018).

2.5.7 Gopher Tortoise Studies

Gopher tortoise (*Gopherus polyphemus*) surveys at NSB Kings Bay were initiated in 1996. That initial survey identified 315 burrows distributed across 21 locations on the installation (GDNR 1997). A second survey conducted seven years later, in 2003, determined that gopher tortoise habitat had deteriorated due to canopy closure and a lack of beneficial forestry management. The number of burrows identified in the same 21 locations decreased to 129, of which 75 (58%) were active (CZR 2004). Five years later, in 2008, a third survey was conducted. Forestry management, such as more frequent prescribed burns, had improved the habitat by then, and 378 burrows were identified, of which 217 (57%) were active. At least 128 gopher tortoises were estimated to be on NSB Kings Bay at that time. During the next comprehensive survey, in 2013, slightly fewer total burrows were observed (n=351), but the number of active burrows had increased substantially from 217 in 2008 to 300 in 2013 (Tuberville et al. 2014). The greatest concentration of burrows and gopher tortoises are in the northwest portion of the installation (Tuberville et al. 2009; Tuberville et al. 2014). In 2015-16, remote cameras were deployed at active gopher tortoise burrows in Etowah Parka and the northwest corner of NSB Kings Bay to document commensal species that used the burrows. This survey identified a total of 56 vertebrate species, including 25 bird species, 16 mammal species, and 15 reptile species (Brown and Tuberville 2018). The Navy is a partner in the *Candidate Conservation Agreement for the Gopher Tortoise (Gopherus polyphemus) Eastern Population*.

2.5.8 Wetlands Delineation

In September 1994, a formal delineation of the wetland jurisdictional boundaries on NSB Kings Bay was completed. Wetland areas on the installation were mapped using the criteria in the *United States Army Corps of Engineers* (*USACE) Wetlands Delineation Manual for Identifying and Delineating Jurisdictional Wetlands* (USACE 1987). A wetland delineation update was performed in 2005 on the western half of NSB Kings Bay. The survey findings are discussed in detail in Section 3.3.2. Since those past efforts, any wetlands delineations on the installation have been completed in order to permit specific training exercises and construction projects.

2.5.9 Neotropical Migratory Bird Surveys

Comprehensive neotropical migratory bird studies were completed as a collaborative effort between the DoN, GDNR, and the USDOI in 1994-96, with winter and breeding-season bird surveys updated in 2004-05. The purpose of these surveys were to determine avian species composition, habitat preferences, and abundance of upland birds at NSB Kings Bay, with particular attention to the painted bunting (*Passerina ciris*) and other neotropical migrants (Kepler and Sykes 1996; Burst and Fleming 2005; Forsythe 2005). The results of these surveys are presented in Section 3.4.2.1. Specialized bird surveys followed in subsequent years. For example, a shorebird survey was completed in 2005 (SAIC 2005) and a winter survey of aquatic birds was completed in 2007 (Boykin and Hagedorn 2008). Additionally, wood stork studies were carried out on the installation in 2006 (Bryan et al. 2007) and 2008-09 (Bryan and Depkin 2009). A follow-up to the more comprehensive 2004-05 bird survey was conducted in 2010-11 (Depkin et al. 2011) and a follow-up survey of aquatic birds was conducted in 2011-12 (Bryan et al. 2012). Acoustic nocturnal bird surveys were conducted in summer 2017 (LG2 2018). A wading bird survey, with emphasis on wood storks, was begun in the summer of 2018.

2.5.10 Manatee Monitoring Program

The Manatee Monitoring Program was established by the DoN and the National Parks Service in the early 2000's to monitor local manatees and effects on them associated with the DoN's use of Cumberland Sound. From 2006 to 2013 the DoN provided GDNR with funds to conduct manatee aerial surveys at Cumberland Sound. The objectives of the surveys were to document inter- and intra-annual manatee abundance and collect photo-identification data. Surveys found that manatee abundance varied greatly within and among years. Peak manatee abundance estimates occurred in June-July annually, while fewer manatees were present in April-May and August-October.

In 2014 GDNR initiated a satellite telemetry and health assessment project in cooperation with the U.S. Navy, Sea to Shore Alliance (S2S), Georgia Aquarium and other partners. Objectives are to document fine-scale movement of manatees within and around NSB Kings Bay, investigate migratory movements, behavior and habitat use of manatees as they disperse throughout coastal Georgia, and assess health of captured manatees. Thus far, the monitored manatees have spent most of their time in estuaries between the barrier islands and the mainland, using Cumberland Sound and tidal rivers to move among estuaries, and occasionally venturing short distances up freshwater rivers (George 2018).

2.5.11 Georgia Natural Heritage Program

The Georgia Natural Heritage Program (GNHP) was established in 1986 through a cooperative agreement between the GDNR and TNC. GNHP is funded primarily by state and Federal monies and is located within the Nongame Wildlife & Natural Heritage Section of the GDNR. GNHP completes assessments and documents occurrences of plants, animals, and biological communities to better understand the ecological process and to support natural diversity.

Recently, NSB Kings Bay proposed the entire area surrounding the North River for registration as a natural area with the GNHP. Registration with the GNHP is strictly voluntary and offers no additional protective status, but does provide recognition for the landowner. Furthermore, the designation provides land for environmental tours for school-age children and other conservation groups to promote public awareness and environmental stewardship.

2.5.12 NSB Kings Bay Mitigation Program

The Final Supplement to the Environmental Impact Statement (EIS) for the construction of the Naval Submarine Base Kings Bay indicated that 12 acres of salt marsh would be destroyed during construction. The Department of the Army (DoA) permit #074 OYN 004217 (Modified May 1985, Condition I) stipulated that any construction loss of salt marsh above the 12-acre limit must be mitigated on a one-to-one ratio.

Mitigation sites were determined to be Davis Farm, Rabbit Run, Kamehameha, and the Pagan Creek Site. During mitigation design, consideration was given to a weir to maintain water levels and enhance the effectiveness of the area as a salt marsh. Furthermore, the habitat created by the pond surrounded by marsh vegetation at the Pagan Creek Site provides feeding and resting conditions attractive to many species of wading birds and waterfowl.

2.5.13 Artificial Reef Program

GDNR is the holder of the USACE Regional Permit #074 OYN RP0036, granting GDNR authority to site and construct artificial reefs offshore from St. Marys and Cumberland Islands, even though these waters are designated as Federal waters. Because of the high importance of the military mission and the need for deep-water access without obstructions, the GDNR, NSB Kings Bay, and other interested parties must coordinate during the siting process. Consequently, NSB Kings Bay is designated as a reviewing entity for any artificial reef sitings located in the waters surrounding the installation.

2.5.14 Pagan Creek Biological Consultation

NSB Kings Bay has agreed through consultation with the USFWS Brunswick Field Office, and technical assistance with GDNR, to change the Pagan Creek Plan to achieve the desired salt marsh results while simultaneously creating wood stork foraging habitat. The Pagan Creek Wood Stork Management Site Plan was submitted to the USFWS and GDNR, where it was reviewed and approved. The plan uses an existing borrow pit and erosion control terraces for the wood stork foraging habitat. The erosion control terraces also trap wood stork prey on outgoing tides. A watchable wildlife tower has been constructed on the site for use by local schools and civic organizations during educational field trips.

2.5.15 Research Program in Forest Resources Management

As part of the expansion of NSB Kings Bay, the DoN implemented a land treatment system to further treat the domestic and light industrial wastewater generated on the installation. Because the original land treatment engineering and design study did not address forest management in detail, the U.S. Navy Department of Natural Resources of the Southern Division Naval Facilities Engineering Command funded a 5-year project with the University of Georgia to analyze the NSB Kings Bay land treatment system and develop general forest management guidelines.

2.5.16 Pond Management for Algae Control

A management plan was prepared to evaluate alternative methods of algae control at some ponds on NSB Kings Bay. Four management alternatives were evaluated and included: 1) No Action, 2) Physical Controls (restructuring ponds), 3) Biological Controls, and 4) Chemical Controls. Biological control through the introduction of triploid grass carp (*Ctenopharyngodon idella*) was recommended for ponds with filamentous algae control problems.

2.5.17 Dolphin Density Assessment

Seasonal dolphin density was assessed in the waters around NSB Kings Bay in 2016-17. The greatest numbers of dolphins were observed at the southern end of the wharf area and adjacent to Site VI and the Magnetic Silencing Facility (MSF). After correcting for perception bias, the greatest adjusted density of dolphins occurred in summer, followed by winter, spring, and fall (GSRC 2017). The results of this assessment are used in applications for Level B harassment permits from the National Marine Fisheries Service for in-water noise associated with waterfront construction.

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3 Existing Environment

3.1 Climate

NSB Kings Bay is located along the Georgia Atlantic coastline. The climate is characterized by mild winters and hot, humid, but breezy summers (Table 3-1). This region receives an average of approximately 44 inches of rainfall per year. The month of January is typically the coldest month of the year with an average of 52 degrees Fahrenheit (°F). July is typically the hottest month of the year with an average high temperature of 83 °F; however, the entire summer is hot in southern Georgia.

Table 3-1. Average Temperatures and Rainfall in the Brunswick, Georgia Vicinity, 1990-2015

Month	Average Temperature (°F)	Average Low Temperature (°F)	Average High Temperature (°F)	Average Rainfall (inches)
January	52.3	43.5	61.0	3.0
February	54.7	46.1	63.3	2.9
March	60.7	52.1	69.2	3.5
April	67.1	58.9	75.2	2.6
May	74.7	67.2	82.1	2.2
June	80.2	73.1	87.2	5.6
July	82.7	75.4	89.9	4.3
August	81.9	75.1	88.6	5.8
September	78.3	71.9	84.7	5.6
October	70.2	62.5	77.8	4.6
November	61.2	52.7	69.7	1.8
December	54.8	46.2	63.4	2.3
Average for all years	**68.2**	**60.4**	**76.0**	**43.9**

Source: Internet www.ncdc.noaa.gov

3.2 Geology, Topography, and Soils

The Kings Bay area was greatly influenced by the raising and lowering of the sea during the Pleistocene and Holocene epochs of the Quarternary Period (USDA 1980). NSB Kings Bay lies in the coastal plain physiographic region. Remnants of the Pamlico shoreline are evident at the western edge of NSB Kings Bay and Princess Ann Shoreline prevails throughout the eastern portion of NSB Kings Bay. Surficial deposits on NSB Kings Bay vary from 40 to 100 feet. Depths of this material affect

dredging and excavation requirements in the waterfront area. Stratified limestone layers lie beneath the depositional material and are considerably more difficult and expensive to remove than softer surficial deposits.

The surface geology of the Kings Bay region is made of eroded sedimentary rock, primarily derived from three types of sediments: limestone, sandstone, and shale, with layers of sand and clay. The soils are derived from marine sediments (USDA 1980). The main complex found on Kings Bay is the Silver Bluff Shoreline Complex. It contains the intercoastal flats, the salt marshes, and the offshore barrier islands. More recent deposits are located on the floodplains of the major streams. These floodplain deposits are of coastal plain origin.

Topographic elevations within NSB Kings Bay range from zero feet mean sea level (msl) along Kings Bay and Cumberland Sound, to approximately 30 feet above msl at the western boundary of the property. Significant slopes on NSB Kings Bay property exist only along the stream banks or the eastern shoreline, which is a previous barrier island formation. Otherwise, the installation is virtually flat with no outstanding natural landforms. Surface runoff is slow due to the presence of minimal slopes, high water tables, and dense ground vegetation that restricts water movement.

Soils on the installation represent constraints to development because of their poor drainage characteristics. Of the seven soil types (Figure 3-1) found on the property, only two have a depth to the seasonal high water table greater than 1.5 feet. All soils on the installation are derived from marine sediments, and consist primarily of sands on the upland areas and clays in the tidal wetland areas. The upland soils have similar characteristics, except for the Cainhoy fine sand, which is the only well drained soil type on the installation.

Table 3-2 indicates the soil type, acreage, development potential rating, development restrictions, and a brief description of the characteristics of the soils identified on NSB Kings Bay. The primary soil classification is Mandarin fine sands, which is characterized by poorly drained soils with approximately zero-to-2 percent slope. Mandarin fine sands cover approximately 75 percent of NSB Kings Bay. The soils of minor extent in this area are Pelham, Rutledge, Meggett fine sand, Pottsburg, and Cainhoy soils, with the Bohicket Capers soils association occurring in the saltwater marshes. Additional soils data may be obtained from the *USDA Soil Survey for Camden and Glynn County, Georgia* (USDA 1980).

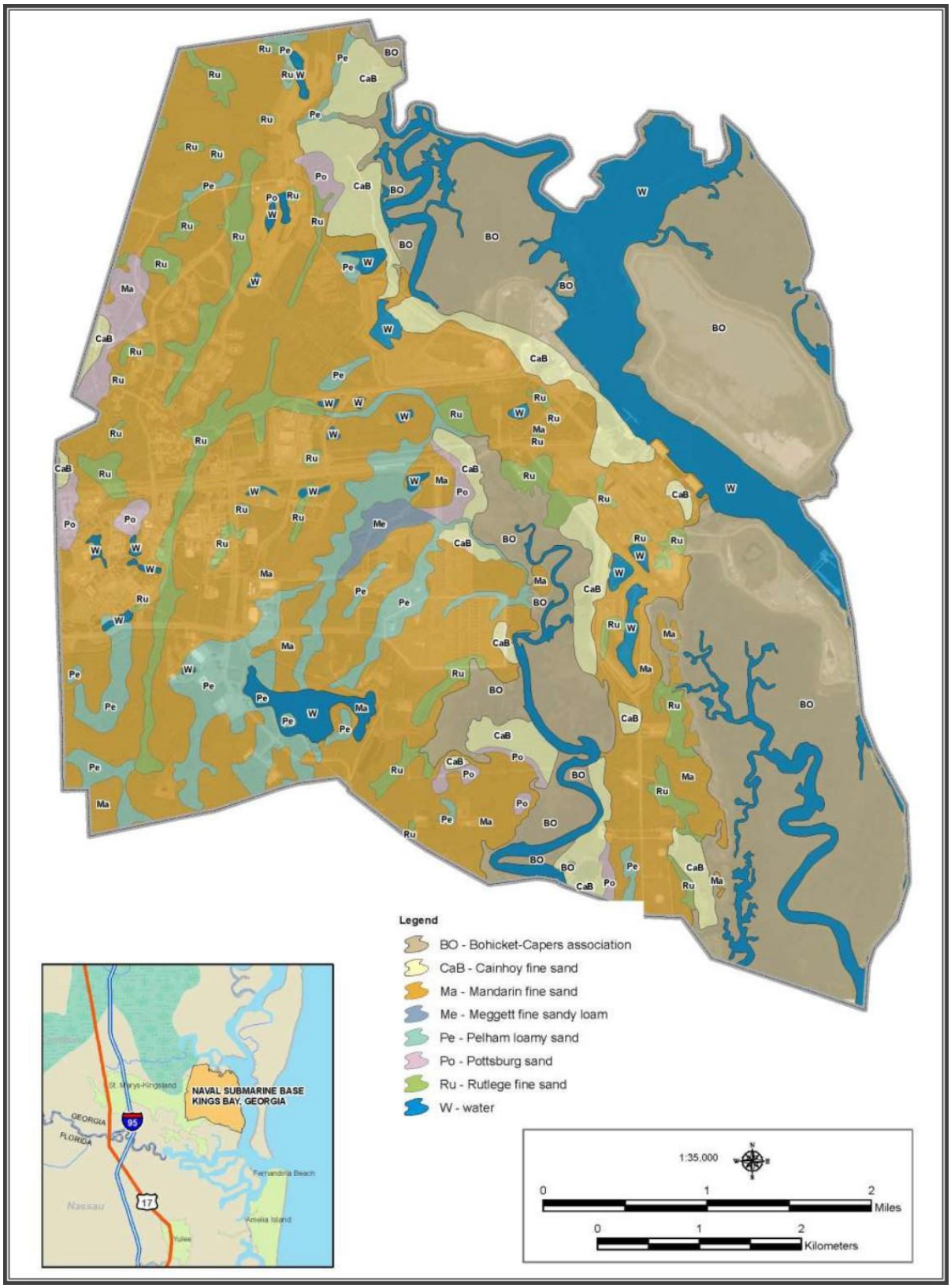

Figure 3-1. Soils at NSB Kings Bay, Georgia.

Table 3-2. Soil Map Units and Acreage Occurring on NSB Kings Bay, Georgia.

Type of Soil	Rating	Description	Soil Uses
Cainhoy fine sand	Class I	Deep, excessively drained.	Good for most urban uses; too sandy for recreation; very poor for wetland wildlife.
Meggett fine sandy loam	Class IV	Deep, poorly drained. Good for wetland use.	Soil has poor urban uses limited by wetness; good potential for loblolly and slash pine; good areas for wetland wildlife.
Pelham loamy sand	Class III	Deep, poorly drained.	Soil has poor urban uses constrained by wetness and flooding; potentially good for loblolly and slash pine; fair for wetland wildlife.
Mandarin fine sand	Class II	Somewhat poorly drained; typical in woodland areas.	Soil has poor urban uses constrained by soil wetness, but may be modified by drainage systems and other modifications; fair for loblolly and slash pine. Very poor for wetland wildlife.
Rutlege fine sand	Class IV	Deep, very poorly drained soils on upland flats and depressions.	Soil has poor potential for urban uses due to wetness and ponding of floodwaters. Potential is good for loblolly and slash pine, and is fair for wetland wildlife.
Pottsburg sand	Class II	Poorly drained soils.	Potential is poor for most urban uses due to wetness; however, wetness may be limited by drainage systems and other modifications. Fair potential for loblolly and slash pine, and is very poor for wetland wildlife.
Bohicket-Capers association	Class IV	Very poorly drained soils found mostly in open areas.	Good potential for wetland wildlife, but is poor for most other uses.

Source: USDA, Soil Survey of Camden and Glynn Counties, Georgia, 1980.

3.3 Hydrology

3.3.1 Surface Waters

Major surface water bodies on and adjacent to the installation include the North River, Cumberland Sound, Kings Bay and Marianna and Mill Creeks. Other surface water bodies on NSB Kings Bay include approximately 300 acres of open water (13 manmade ponds totaling 175 acres, 60 acres of estuarine waters, and 75 acres of other lakes/ponds), wetland areas, and a series of open ditches to convey stormwater. The freshwater ponds are all located on the western portion of the installation, were manmade, and were either initially intended for stormwater retention or drained and re-created as freshwater fisheries.

3.3.2 Wetlands

Wetlands are generally considered to be transitional zones between the terrestrial and aquatic environment, and are characterized by physical, chemical, and biological features indicative of hydrological conditions. Currently, wetlands are regulated by the USACE under Section 404 of the Clean Water Act of 1972. Wetlands are defined by the USACE as "…those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." (USACE Federal Register 1982)

In 1994, the NSB Kings Bay wetlands were formally delineated by the Navy, using the USACE methodology. For the most part, the wetlands on the installation are associated with low areas and drainage ditches, which eventually empty into Kings Bay and Cumberland Sound (Figure 3-2). Salt marsh wetlands dominate the shoreline, accompanied by Maritime forests. Slash pine flatwoods can be found throughout the western portion of the installation.

Approximately 4,000 acres of wetlands were identified on NSB Kings Bay in 1994; these consist primarily of five wetland types identified as 1) cypress domes, 2) cypress/blackgum swamps, 3) shrub swamps, 4) low pine flatwoods, and 5) salt marsh. Manmade ponds comprise most of the open water wetlands on the installation, and are currently managed as recreational fishing areas.

Wetlands on NSB Kings Bay are typical of wetland complexes found along coastal areas of the southeastern U.S. forested wetlands on the installation are dominated by slash pine (*Pinus elliottii*) in the low pine flatwoods and pond cypress (*Taxodium ascendens*) and bald cypress (*T. distichum*) in the cypress domes. Various other species occur in the shrub layer of these forested wetlands, including gallberry (*Ilex glabra*), waxmyrtle (*Myrica cerifera*), laurel oak (*Quercus hemispherica*), titi (*Cliftonia* spp.), and vines (*Smilax* spp.). Shrub wetlands generally contain the same species found in the forested wetlands, and for the most part are isolated or mixed with the forested wetlands. Salt marsh wetland is the largest wetland community type found on NSB Kings Bay. Salt marsh wetlands contain various sedges and rushes (*Juncus* spp. and *Rhyncospera* spp.), which are dominated by smooth cordgrass (*Spartina alterniflora*) and black needlerush (*Juncus roemerianus*).

In 2005, the Navy updated the wetland delineation for a portion of NSB Kings Bay (see Figure 3-2). The mapping update of the 3,295 acres occurred in fee-owned lands and was performed to facilitate the design of future land use plans that minimize impacts to wetlands on NSB Kings Bay. Of the areas re-mapped in 2005, the total wetland area was 481.8 acres and 51.8 acres were classified as "other surface waters". Cypress/blackgum swamps were the most common wetland systems found

within the 2005 wetland delineation. Since 2005, wetland delineations have been highly localized and funded only by specific military training or construction requirements for inclusion in required permit packages.

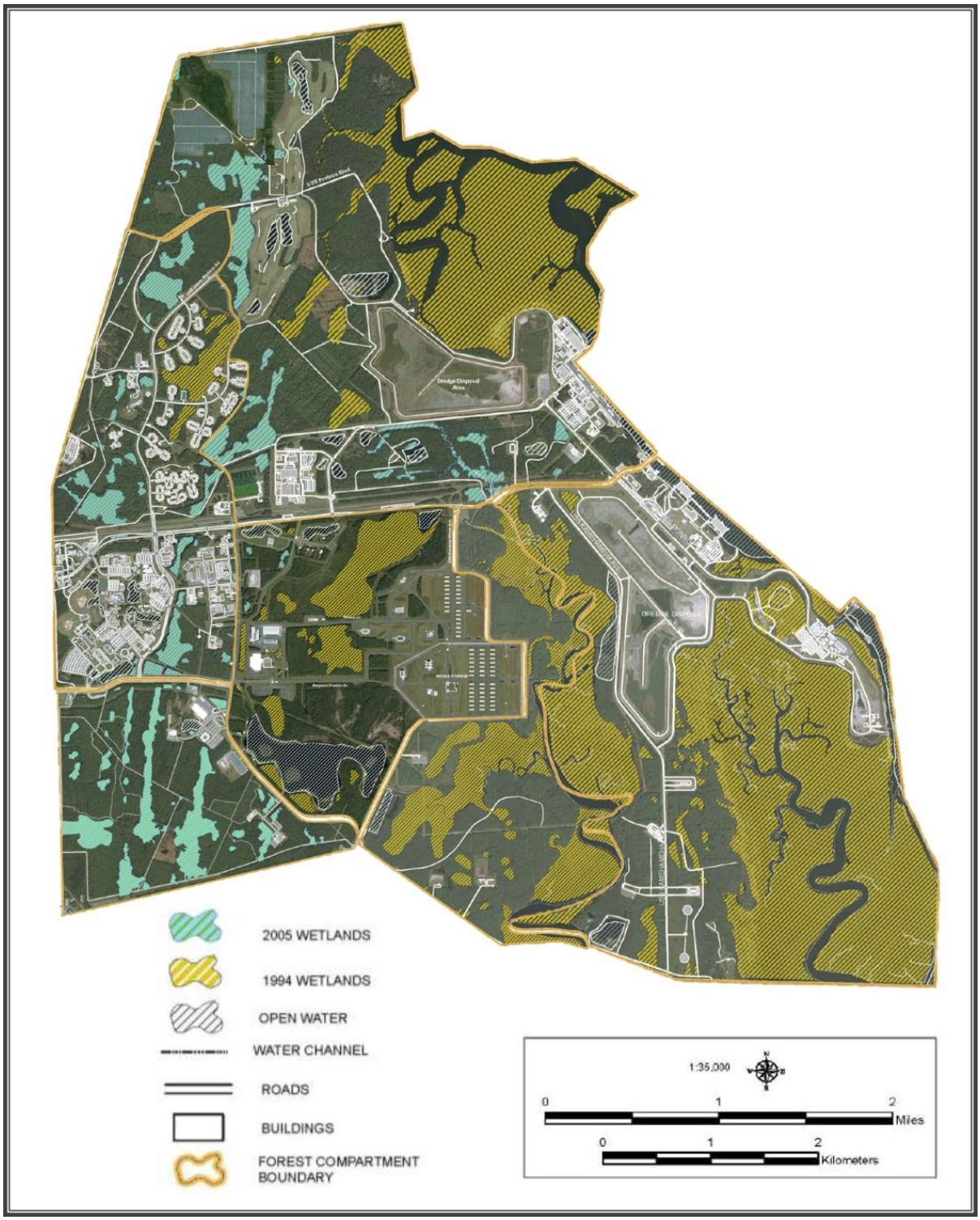

Figure 3-2. Wetlands at NSB Kings Bay, Georgia.

3.3.3 Floodplains

Floodplains are defined as low and relatively flat areas adjoining inland and coastal waters, and include flood-prone areas of offshore islands. The Federal Emergency Management Agency (FEMA) defines these areas as being subject to a one percent or greater chance of flooding in any given year. The 100-year floodplain is the controlling elevation for installation construction. Table 3-3 indicates the floodplain elevations and establishes the minimum first-floor elevations for structures.

Table 3-3. Floodplain Elevations at NSB Kings Bay, Georgia.

Return Frequency	Tide Height (ft msl)	Tide Height (ft mlw)	Recommended Floor Elevation (ft mlw)
10 year	6.8	9.8	None
100 year	12.4	15.4	17.0
500 year	16.5	19.5	20.0

Source:DoN 1985.

Key:
ft msl = feet above mean sea level
ft mlw= feet above mean low water

3.3.4 Groundwater

Three sources provide fresh groundwater in the Kings Bay area: the water table aquifer, the secondary artesian aquifer, and the primary artesian aquifer. The water table aquifer is primarily used for irrigation; the primary artesian aquifer serves the public water supply; and the secondary aquifer is not widely used because of its extremely variable water yield.

The water table aquifer consists of sands and limestone; limestone thickness ranges from 40 to 90 feet. The water is characterized as being somewhat acidic, with elevated organic carbon concentrations, and generally less mineral content than deeper groundwater. Mercury concentrations were found to exceed Federal Primary Drinking Water Standards (U.S. Environmental Protection Agency [EPA] 1976). The possible use of mercury-based fungicides in forest areas was cited as the probable reason for the higher than allowable levels (SUBASE 1976). Six monitoring wells were located throughout the installation, and have been monitored quarterly since May 1978 (Jones, Edmonds, and Associates, Inc. 1979).

3.4 Vegetation and Wildlife

The management of wildlife and vegetation in NSB Kings Bay's INRMP is consistent with Georgia's Department of Natural Resources (GDNR) "A Comprehensive Wildlife Conservation Strategy for Georgia". In GDNR's document, conservation goals are defined broadly, while

discussions of strategies and partnerships more specifically address the objectives that must be met to achieve these goals. Similar to NSB Kings Bay's INRMP, conservation goals, strategies and partnerships are identified for different management areas.

3.4.1 Vegetation

NSB Kings Bay contains a variety of vegetation communities resulting in a high degree of ecological diversity. Vegetation communities include: 1) waterfront communities; 2) transition zone communities; and 3) inland plant communities. The salt marsh community includes high marsh, salt flats and low marsh communities. Transition zone communities include maritime strand forest, lowland maritime forest, upland maritime forest, bluff forest and evergreen scrub forest. Inland plant communities include pine flatwoods, cypress gum wetland, shrub bog, bay swamp and mixed hardwood drain forest. Recent changes in land cover at NSB Kings Bay, such as the construction of a large solar array in the northwestern part of the installation and expansion of invasive species-dominated habitats warranted updates to the land cover map of NSB Kings Bay, which were performed by GDNR in 2017 (Leonard et al. 2018; Figure 3-3).

3.4.1.1 Waterfront Communities

Coastal Plain Salt and Brackish Tidal Marsh

Coastal plain salt and brackish tidal marsh communities cover approximately 26 percent of the NSB Kings Bay property; they form a contiguous border along the edges of estuaries extending into the mouths of creeks and rivers as far as the zone of tidal influence. Salt marshes are a vital component of the ecosystem in this area because they are significant in storm buffering and pollution filtration. In most areas, perennial grasses and rushes predominate. The salt marsh community occurs on nearly every level and every poorly drained site with the Bohicket-Capers soil association (USDA 1980). Three distinct sub-communities are recognized: high marsh, salt flats, and low marsh.

High marsh is the highest zone along the upper edge of the salt marsh, and is flooded by tides for approximately one hour each day. Within this area, black needlerush predominates, forming extensive, dense stands. Other perennial herbs such as marsh dropseed (*Sporobolus virginicus*), salt meadow cordgrass (*Spartina patens*), sea lavender (*Limonium carolinianum*), and sea ox-eye (*Borrichia frutescens*) are common, as are shrubs such as false-willow (*Baccharis angustifolia*),

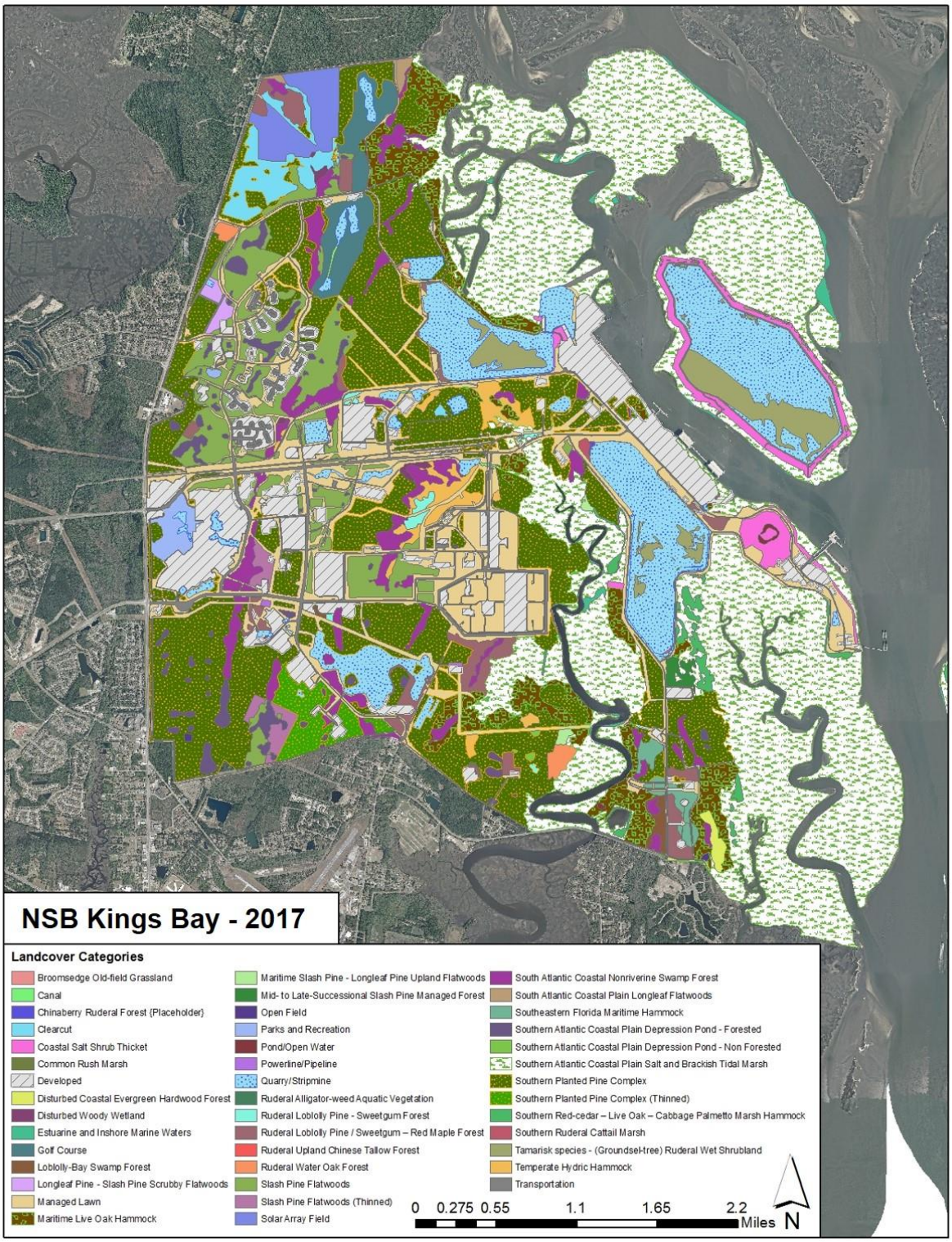

Figure 3-3. Land Cover at Naval Submarine Base (NSB) Kings Bay, Georgia.

groundsel tree (*Baccharis halimifolia*), and marsh elder (*Iva frutescens*). The upper reaches of tidal creeks are also characterized by high marsh vegetation.

Salt flats are open sandy areas with sparse vegetation within the salt marsh zone. As the tide recedes, salt water collects in small shallow pools, and stands for extended periods during low tides. Evaporation increases the salt concentration to extreme levels, thus, only salt-tolerant plants, such as alkalai grass (*Distichlis spicata*), the succulent glasswort (*Salicornia* spp.), and saltwort (*Batis maritima*), can thrive in salt flats.

Low marsh areas are lower elevation salt marsh zones flooded by tides for longer periods of time and at greater depths. At high tide, the water in the low marsh may be several feet deep. Smooth cordgrass forms dense monotypical stands in the low marsh.

Southern Red Cedar - Live Oak - Cabbage Palmetto Marsh Hammock

The Southern red cedar – live oak – cabbage palm marsh hammock is common on slightly elevated sites in and adjacent to salt marshes. This community has very low species diversity and limited herbaceous cover (Wharton 1978).

Species common to this community are southern red cedar (*Juniperus virginiana* var. *silicicola*), live oak (*Quercus virginiana*), sabal palm (*Sabal palmetto*), yaupon holly (*Ilex vomitoria*), saw palmetto (*Serenoa repens*), waxmyrtle (*Morella cerifera*), false-willow, sea-oxeye, and fringe-rush (*Fimbristylis castanea*). One Georgia state species of special concern, the Florida privet (*Forestiera segregata*) has been located within this community.

3.4.1.2 Transition Zone Communities

Maritime Live Oak Hammock

Maritime live oak hammock occurs primarily in depressions and adjacent to shallow creeks just above the upper reaches of the salt marsh. Some species found in this community include live oak, water oak (*Q. nigra*), laurel oak (*Q. hemispherica*), loblolly pine (*Pinus taeda*), swamp bay (*Persea palustris*), yaupon holly, cross-vine (*Bignonia capreolata*), dwarf smilax (*Smilax pumila*), saw palmetto, dangleberry (*Gaylussacia frondosa*), and partridge berry (*Mitchella repens*). Two Georgia state species of special concern, the pine-needle airplant (*Tillandsia setacea*) and greenfly orchid (*Epidendrun conopseum*) have been found in the maritime live oak hammock community.

Southeastern Florida Maritime Hammock

This is a distinctive community, identified by an overstory of scrub oaks and understory of evergreen shrubs. At NSB Kings Bay, this community is found at relatively flat sites. Fire is important for the conservation of this community, as it is for all communities at NSB Kings Bay. Rare plants in this area include Chapman oak (*Quercus chapmanii*), bluff oak (*Q. austrina*), and tar-

flower (*Befaria racemosa*). Woody species observed in this community include Carolina holly, American holly (*I. opaca*), stagger-bush (*Lyonia fruticosa*), fetterbush, wax myrtle, wild olive, slash pine, loblolly pine, sand live oak (*Quercus geminata*), laurel oak, myrtle oak (*Q. myrtifolia*), water oak, live oak, and saw palmetto.

3.4.1.3 Inland Plant Communities

Southern Planted Pine Complex

Southern planted pine complex and its associated land cover types (*e.g.*, slash pine flatwoods, slash pine flatwoods [thinned], ruderal loblolly pine - sweetgum forest, longleaf pine - slash pine scrubby flatwoods, maritime slash pine - longleaf pine upland flatwoods) represent the dominant inland plant communities on the installation, comprising approximately 20.5% of the total land cover. The understory within these communities consists mostly of oaks, loblolly bay (*Gordonia lasianthus*), water tupelo (*Nyssa aquatica*), maple (*Acer* spp.), holly (*Ilex* spp.), southern red cedar, bays (*Persea* spp.), and wax myrtle. The planted pine complex is best maintained by frequent burnings. Many of the plants located within these communities are fire tolerant. Human intervention has reduced the fire frequency in natural pine communities and, in the absence of fire, succession has increased the relative dominance of understory hardwoods. Most of the planted pine complex communities are predominated by slash pine; however, there are some areas where longleaf pine is the predominant species.

Loblolly-Bay Swamp Forest

Loblolly-bay swamp forest and its associated land cover types (*e.g.*, disturbed woody wetland, Southern Atlantic coastal plain depression pond, and temperate hydric hammock) are characterized by a predominance of broadleaf evergreen trees and water-saturated soils (Wharton 1978). At NSB Kings Bay, these communities occur along drainages between the pine flatwoods and the salt marsh. In general, they are located adjacent to both salt marsh and maritime forest types. The following plant species are observed in the loblolly-bay swamp forest community: red maple, loblolly bay, sweet gallberry (*Ilex coriacea*), Virginia willow (*Itea virginica*), male-berry (*Lyonia ligustrina*), fetterbush, sweetbay, blackgum, swamp bay (*Persea palustris*), pond pine, water oak, and highbush blueberry.

3.4.2 Wildlife

NSB Kings Bay natural communities support numerous wildlife species. This includes several small game species (*e.g.*, gray squirrel [*Sciurus carolinensis*], northern bobwhite [*Colinus virginianus*]) and large game species such as white-tailed deer (*Odocoileus virginianus*). Other game species present include rabbit (*Sylvilagus* sp.), mourning dove (*Zenaida macroura*), rails (*Rallus* sp.),

ducks (*Aix sponsa*, *Anas* sp., *Aythya* sp.) and coots (*Fulica americana*). Non-game mammal species occurring on NSB Kings Bay include flying squirrel (*Glaucomys volans*), gray fox (*Urocyon cinereoargnteus*), raccoon (*Procyon lotor*), river otter (*Lutra canadensis*), bobcat (*Lynx rufus*), Virginia opossum (*Didelphis marsupialis*), eastern woodrat (*Neotoma floridana*), and eastern harvest mouse (*Reithrodontomys humulis*). Numerous bird species (including neotropical migratory species described below) occur on NSB Kings Bay and include osprey (*Pandion haliaetus*), marsh hawk (*Circus cyaneus*), red-tailed hawk (*Buteo jamicensis*), loggerhead shrike (*Lanius ludovicianus*), screech owl (*Otus asio*), black vulture (*Coragyps atratus*), white ibis (*Eudocimus albus*), great blue heron (*Ardea herodias*), double-crested cormorant (*Phalacrocorax auritus*), pileated woodpecker (*Drycopus pileatus*), downy woodpecker (*Picoides pubescens*), hairy woodpecker (*P. villosus*), and a multitude of passerine birds [numerous other wading birds (see Table 3-4].

3.4.2.1 Neotropical Migratory Bird Species

NSB Kings Bay also provides habitat to a large number of neotropical migratory bird species. Neotropical bird species breed in Canada and the U.S. during the summer months, and winters in Mexico, Central America, South America, or the Caribbean islands. Table 3-4 identifies the most common neotropical migratory bird species on NSB Kings Bay based upon surveys conducted in 1995-1996, 2005, and 2010. An additional bird survey on NSB Kings Bay was initiated in 2018, focusing on wading birds. In total, 182 bird species have been detected on the installation (Table 3-4).

During the most recent bird surveys, the dominant species found in all habitats were flocking frugivores such as yellow-rumped warblers (*Dendroica coronata*) and American robins (*Turdus migratorius*). Other dominant species were winter residents such as gray catbird (*Dumetella carolinensis*), hermit thrush (*Catharus guttatus*) and eastern towhee (*Pipilo erythrophthalmus*), which feed on fruit and seeds; and resident species such as red-bellied woodpecker (*Melarnerpes carolinus*) and Carolina wren (*Thryothorus ludovicianus*), which feed on insects and seeds. The most unusual bird seen was the winter wren (*Troglodytes troglodytes*) which reaches the extreme edge of its wintering range in South Georgia.

Because of the high diversity and abundance of bird species identified on NSB Kings Bay and general declines in the population of some of these species in the eastern U.S., the management of individual habitats is critical to the conservation and enhancement of the NSB Kings Bay neotropical migratory bird populations. Specific management practices to enhance these populations are addressed in later sections of the INRMP.

Table 3-4. Neotropical Migrant Bird Species Identified at NSB Kings Bay, Georgia

Common Name	*Scientific Name*
Acadian Flycatcher	*Empidonax virescens*
American Coot	*Fulica americana*
American Crow	*Corvus brachyrhynchos*
American Goldfinch	*Spinus tristis*
American Kestrel	*Falco sparverius*
American Oystercatcher	*Haematopus palliatus*
American Redstart	*Setophaga ruticilla*
American Robin	*Turdus migratorius*
Anhinga	*Anhinga anhinga*
Bald Eagle	*Haliaeetus leucocephalus*
Barn Swallow	*Hirundo rustica*
Barred Owl	*Strix varia*
Belted Kingfisher	*Megaceryle alcyon*
Black and White Warbler	*Mniotilta varia*
Black Vulture	*Coragyps atratus*
Black-crowned Night-Heron	*Nycticorax nycticorax*
Blackpoll Warbler	*Setophaga striata*
Black-throated Blue Warbler	*Setophaga caerulescens*
Blue Grosbeak	*Guiraca caerulea*
Blue Jay	*Cyanocitta cristata*
Blue-gray Gnatcatcher	*Polioptila caerulea*
Blue-headed Vireo	*Vireo solitarius*
Boat-tailed Grackle	*Quiscalus major*
Bobolink	*Dolichonyx oryzivorus*
Brown Thrasher	*Toxostoma rufum*
Brown-headed Cowbird	*Molothrus ater*
Brown-headed Nuthatch	*Sitta pusilla*
Canada Goose	*Branta canadensis*
Carolina Chickadee	*Poecile carolinensis*
Carolina Wren	*Thryothorus ludovicianus*
Cattle Egret	*Bubulcus ibis*
Chimney Swift	*Chaetura pelagica*
Chipping Sparrow	*Spizella passerine*
Chuck-will's-widow	*Caprimulgus carolinensis*
Clapper Rail	*Rallus longirostris*
Common Grackle	*Quiscalus quiscula*
Common Ground-Dove	*Columbina passerina*
Common Moorhen	*Gallinula chloropus*

Common Name	*Scientific Name*
Common Nighthawk	*Chordeiles minor*
Common Yellowthroat	*Geothlypis trichas*
Coopers Hawk	*Accipiter cooperii*
Double-crested Cormorant	*Phalacrocorax auritus*
Downy Woodpecker	*Picoides pubescens*
Eastern Bluebird	*Sialia sialis*
Eastern Kingbird	*Tyrannus tyrannus*
Eastern Meadowlark	*Sturnella magna*
Eastern Phoebe	*Sayornis phoebe*
Eastern Screech Owl	*Megascops asio*
Eastern Towhee	*Pipilo erythrophthalmus*
Eastern Wood-Pewee	*Contopus virens*
European Starling	*Sturnus vulgaris*
Fish Crow	*Corvus ossifragus*
Golden-crowned Kinglet	*Regulus satrapa*
Grasshopper Sparrow	*Ammodramus savannarum*
Gray Catbird	*Dumetella carolinensis*
Great Blue Heron	*Ardea herodias*
Great Crested Flycatcher	*Myiarchus crinitus*
Great Egret	*Ardea alba*
Great Horned Owl	*Bubo virginianus*
Greater Yellowlegs	*Tringa melanoleuca*
Green Heron	*Butorides virescens*
Hairy Woodpecker	*Picoides villosus*
Hermit Thrush	*Catharus guttatus*
Hooded Merganser	*Lophodytes cucullatus*
Hooded Warbler	*Wilsonia citrine*
House Finch	*Haemorhous mexicanus*
House Wren	*Troglodytes aedon*
Indigo Bunting	*Passerina cyanea*
Killdeer	*Charadrius vociferous*
Laughing Gull	*Larus atricilla*
Le Conte's Sparrow	*Ammodramus leconteii*
Least Bittern	*Ixobrychus exilis*
Little Blue Heron	*Egretta caerulea*
Loggerhead Shrike	*Lanius ludovicianus*
Louisiana Waterthrush	*Seiurus motacilla*
Marsh Wren	*Cistothorus palustris*
Mourning Dove	*Zenaida macroura*

Table 3-4, continued.

Common Name	*Scientific Name*
Northern Bobwhite	*Colinus virginianus*
Northern Cardinal	*Cardinalis cardinalis*
Northern Flicker	*Colaptes auratus*
Northern Harrier	*Circus hudsonius*
Northern Mockingbird	*Mimus polyglottos*
Northern Parula	*Parula americana*
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
Orange-crowned Warbler	*Oreothlypis celata*
Orchard Oriole	*Icterus galbula*
Osprey	*Pandion haliaetus*
Painted Bunting	*Passerina ciris*
Palm Warbler	*Setophaga palmarum*
Peregrine Falcon	*Falco peregrinus*
Pileated Woodpecker	*Dryocopus pileatus*
Pine Warbler	*Dendroica pinus*
Red-bellied Woodpecker	*Melarnerpes carolinus*
Red-cockaded Woodpecker	*Picoides borealis*
Red-eyed Vireo	*Vireo olivaceus*
Red-headed Woodpecker	*Melanerpes erythrocephalus*
Red-shouldered Hawk	*Buteo lineatus*
Red-tailed Hawk	*Buteo jamaicensis*
Red-winged Blackbird	*Agelaius phoeniceus*
Ring-billed Gull	*Larus delawarensis*
Rock Pigeon	*Columba livia*
Ruby-crowned Kinglet	*Regulus calendula*
Ruby-throated Hummingbird	*Archilochus colubris*
Savannah Sparrow	*Passerculus sandwichensis*

Common Name	*Scientific Name*
Sedge Wren	*Cistothorus stellaris*
Sharp-shinned Hawk	*Accipiter striatus*
Snowy Egret	*Egretta thula*
Song Sparrow	*Melospiza melodia*
Summer Tanager	*Piranga rubra*
Swamp Sparrow	*Melospiza georgiana*
Tree Swallow	*Tachycineta bicolor*
Tricolored Heron	*Egretta tricolor*
Tufted Titmouse	*Baeolophus bicolor*
Turkey Vulture	*Cathartes aura*
Vesper's Sparrow	*Pooecetes gramineus*
White Ibis	*Eudocimus albus*
White-crowned Sparrow	*Zonotrichia leucophrys*
White-eyed Vireo	*Vireo griseus*
White-throated Sparrow	*Zonotrichia albicollis*
Wild Turkey	*Meleagris gallopavo*
Willet	*Catoptrophorus semipalmatus*
Wilson’s Snipe	*Gallinago delicata*
Wood Duck	*Aix sponsa*
Wood Stork	*Mycteria americana*
Yellow-bellied Sapsucker	*Sphyrapicus varius*
Yellow-billed Cuckoo	*Coccyzus americanus*
Yellow-breasted Chat	*Icteria virens*
Yellow-crowned Night Heron	*Nyctanassa violacea*
Yellow-rumped Warbler	*Dendroica coronata*
Yellow-throated Vireo	*Vireo flavifrons*
Yellow-throated Warbler	*Dendroica dominica*

3.4.2.2 Reptile and Amphibian Species

Surveys for reptiles and amphibians were performed on NSB Kings Bay in 2017. Eleven species of terrestrial snakes were documented, but species of greatest conservation concern, such as the Eastern indigo snake (*Drymarchon couperi*), southern hog-nosed snake (*Heterodon simus*), and pine snake (*Pituophis melanoleucus*), were not encountered. However, an Eastern indigo snake was identified at the solar farm in 2016, and Eastern diamondback rattlesnake (*Crotalus adamanteus*) was confirmed in 2018, and unverified observations of pine snakes have been reported on base. Although concerted effort was focused in 2017 on capturing diamondback terrapins in the surrounding marshes,

none were caught. Habitats such as lowland swamps, cyprus wetlands, and semi-permanent wetlands with emergent vegetation, which are preferred by the spotted turtle and the striped mud turtle, are present on NSB Kings Bay but no specimens of either species have been found. Also, no gopher frogs have been identified in any herpetofaunal or gopher tortoise surveys on the installation. Two new species of salamanders were identified on the base in 2017: the mole salamander (*Ambystoma talpoideum*) and the red-spotted newt (*Notophthalmus viridescens*). (White et al. 2018). All reptile and amphibian species identified during the 2017 surveys are presented in Table 3-5.

Table 3-5. Reptile and Amphibian Species Identified at NSB Kings Bay, Georgia

Common Name	***Scientific Name***
Alligators	
American alligator	*Alligator mississipiensis*
Frogs	
American bullfrog	*Lithobates catesbeiana*
Eastern narrow-mouthed toad	*Gastrophryne carolinensis*
Eastern spadefoot toad	*Scaphiopus holbrookii*
Green treefrog	*Hyla cinerea*
Greenhouse frog	*Eleutherodactylus planirostris*
Little grass frog	*Pseudacris ocularis*
Pig frog	*Lithobates grylio*
Pine woods treefrog	*Hyla femoralis*
Southern leopard frog	*Lithobates utricularia*
Southern toad	*Anaxyrus terrestris*
Spring peeper	*Pseudacris crucifer*
Squirrel treefrog	*Hyla squirella*
Salamanders	
Mole salamander	*Ambystoma talpoideum*
Red-spotted newt	*Notophthalmus viridescens*
Two-toed amphiuma	*Amphiuma means*
Lizards	
Brown anole	*Anolis sagrei*
Eastern glass lizard	*Ophisaurus ventralis*
Fence lizard	*Sceloporus undulatus*
Five-lined skink	*Plestiodon fasciatus*
Green anole	*Anolis carolinensis*
Ground skink	*Scincella lateralis*
Six-lined racerunner	*Aspidoscelis sexlineatus*
Snakes	
Black racer	*Coluber constrictor*
Canebrake rattlesnake	*Crotalus horridus*
Coachwhip	*Coluber flagellum*
Eastern diamondback rattlesnake	*Crotalus adamanteus*
Eastern hog-nosed snake	*Heterodon platirhinos*
Florida banded watersnake	*Nerodia fasciata*
Gartersnake	*Thamnophis sirtalis*
Harlequin coralsnake	*Micrurus fulvius*
Pygmy rattlesnake	*Sistrurus miliarius*
Red cornsnake	*Pantherophis guttatus*
Scarletsnake	*Cemophora coccinea*
Yellow ratsnake	*Pantherophis alleghaniensis*
Turtles	
Common snapping turtle	*Chelydra serpentina*
Eastern box turtle	*Terrapene carolina*
Eastern chicken turtle	*Deirochelys reticularia*
Eastern mud turtle	*Kinosternon subrubrum*
Florida cooter	*Pseudemys floridana*
Florida softshell turtle	*Apalone ferox*
Gopher tortoise	*Gopherus polyphemus*
Yellow-bellied slider	*Trachemys scripta*

3.5 Aquatic Habitat and Fisheries

NSB Kings Bay contains two distinctive aquatic fisheries habitat systems, an inshore fresh water system and the estuarine system surrounding NSB Kings Bay. The estuary is buffered from the open waters of the Atlantic Ocean by the barrier island system within the Cumberland Sound (*e.g.*, Cumberland Island). Both of these habitats are also vital components of recreational opportunities within the NSB Kings Bay MWR program. More importantly the ecological processes in these systems are critical to the diversity of local and regional flora and fauna of NSB Kings Bay.

3.5.1 Fresh Water System

The fresh water system within NSB Kings Bay is comprised of numerous man-made ponds and wetland impoundments, most of which were constructed during the development of the base. These ponds do serve a recreational and aesthetic purpose to NSB Kings Bay. However, all fresh water systems at NSB Kings Bay are integral components of storm water retention and conveyance.

All of the ponds are stocked with largemouth bass (*Micropterus* sp.*)*, bluegill/redear sunfish *(Lepomis* sp.*),* and channel catfish (*Ictalurus punctatus)*. The populations are monitored and additional stocking is conducted when necessary. In a dual purposed effort to promote sound pond management and ensure the storm water conveyance functions of these systems are maintained, triploid grass carp have also been introduced in several ponds as an aquatic weed control measure. These carp were imported from Malaysia to the U.S. by the USFWS in 1963. Triploid grass carp are not capable of successful reproduction due to an extra set of chromosomes. It has been widely shown that aquatic plant control using triploid grass carp can be obtained for periods of 5 to 10 years (Wynne 2002). All freshwater systems within NSB Kings Bay have been under an intensive fishery management plan since 1986 with the objective of providing an aesthetic outdoor setting with diverse and abundant fish and wildlife recreational use to improve the quality of life of military personnel stationed at NSB Kings Bay (USFWS 1986).

3.5.2 Estuarine System

The estuaries of the Cumberland Sound that surround NSB Kings Bay connect with the open waters of the Atlantic Ocean through the Cumberland and St. Marys Rivers. The estuarine habitat exists predominantly in the form of salt and brackish marsh and is separated from the open ocean by a system of barrier islands (primarily Cumberland Island). By definition estuaries are semi-enclosed bodies of water having free connections with the open sea and having sea water measurably diluted with fresh water derived from land drainage (Pritchard 1967). The salinity in typical Atlantic tidal estuaries are greater than 0.5 parts per thousand (ppt) and can be as high as 30.0 ppt (SAFMC 1998).

This wide and varied range in salinity is a result of the constant mixing of seawater from the Atlantic Ocean and freshwater from the river systems responsible for drainage of the Cumberland Sound, compounded by the daily tidal flow.

The estuarine habitat associated with NSB Kings Bay is directly networked to the open ocean through tidal creeks and the Cumberland and St. Marys River systems. This network of creeks, marshes and tidal flats provides essential fisheries habitat (EFH) as nursery areas for larval and juvenile fish, crustaceans and mollusks. In addition, they serve adult species as critical feeding grounds and refuge areas from predators. Approximately 90 percent of all commercial and recreational landing in the South Atlantic Region (North Carolina to the southern tip of Florida) are composed of estuarine dependant species (SAFMC 1998). The South Atlantic region contains over 894,200 acres of salt and brackish marshes (16 percent of the U.S. total). Within the state of Georgia, there is a total of 213,000 acres coastal brackish and salt marsh habitat (SAFMC 1998).

Estuaries provide crucial habitat for a wide variety of fish, shell fish and other invertebrates. Table 3-6 provides a sample listing of common species that are dependant on estuarine habitats within the South Atlantic region. In fact, tidal estuaries provide critical habitat for target recreational fisheries such as red drum (*Sciaenops ocellatus*) and spotted seatrout (*Cynoscion nebulosus*), as well as the commercial shrimp and oyster fishery. Furthermore, marsh nutrients, detritus and prey species are filtered into the open waters of the Atlantic thereby adding to the support of coastal migratory pelagic (*e.g.*, snapper, grouper mackerel) fishery.

Table 3-6. Fish and Invertebrates Observed in Collections from Marsh Habitats Located in the Southeastern U.S.

Common Name	Scientific Name	Value	Life History
Fish			
American eel	*Anguilla rostrata*	M	C/P
Anchovies	*Anchoa* spp.	M	P
Atlantic croaker	*Micropogonias undulatus*	M	R/C/P
Atlantic menhaden	*Brevootia tyrannus*	M	R/C/P
Black-cheek tonguefish	*Symphurus plagiusa*	M	P
Black crappie	*Pomoxis nigromaculatus*	F	R/C/P
Black drum	*Pogonias cromis*	M	R/C/P
Bluefish	*Pomatomus saltatrix*	M	R/C/P
Flounder	*Paralichthys* spp.	M	R/C/P
Gizzard shad	*Dorosoma cepedianum*	F	C/P
Gobies	*Gobiidae* spp.	R	P

Table 3-6, continued.

Common Name	Scientific Name	Value	Life History
Gray snapper	*Lutjanus griseus*	M	R/C/P
Great barracuda	*Sphyraena barracuda*	M	R/P
Hake	*Urophycis* spp.	M	R/C/P
Killifish	*Fundulus* spp.	R	R/P
Lane snapper	*Lutjanus synagris*	M	R/C/P
Largemouth bass	*Micropterus salmoides*	F	R/C/P
Mojarra	*Eucinostomus* sp.	M	P
Mosquitofish	*Gambusia affinus*	R	P
Mullet	*Mugil* spp.	M	R/P
Pigfish	*Orthopristis chrysoptera*	M	R/P
Pinfish	*Lagodon rhomboides*	M	R/P
Pumpkinseed	*Lepomis gibbosus*	F	R/P
Rainwater killifish	*Lucainia parva*	R	P
Red drum	*Sciaenops ocellata*	M	R/C/P
Sheepshead	*Archosargus probatocephalus*	M	R/C/P
Sheepshead minnow	*Cyprinodon variegatus*	R	P
Silver perch	*Bairdiella chrysoura*	M	R/P
Silversides	*Menidia* spp.	R	P
Spot	*Leiostomus xanthurus*	M	R/C/P
Spotted seatrout	*Cynoscion nebulosus*	M	R/C/P
Striped bass	*Morone saxatilis*	F	R/C/P
White catfish	*Ictalurus catus*	F	R/C/P
Decapods			
Blue crab	*Callinectes sapidus*	M	R/C/P
Fiddler crabs	*Uca* spp.	R	R/C/P
Grass shrimp	*Palaemonetes* spp.	R	P
Penaied shrimp	*Penaeus* spp.	M	R/C/P
Stone crab	*Menippe mercenaria*	R	R/C/P

Codes for the Life History Type heading are R = resident, M = transient (marine spawner), F = transient (freshwater spawner); for the Fisheries Value heading are R = recreational, C = commercial, P = prey species.
(Source: SAFMC 1998)

Estuarine habitat dependence is directly as well as indirectly linked to species. Some organisms are dependent on the emergent vascular plants on which to attach themselves. Some species of mussels and oysters utilize the shell and sediment of tidal pools. Some feed directly on the

vegetation while others feed on the detritus that is filtered into the open ocean. There are resident species that derive their entire life cycle within the estuary and there are transients such as the red drum and the snapper that spawn elsewhere, yet their larva and juveniles are critically tied to the estuary for survival.

3.6 Rare, Threatened and Endangered Species

In 1997, rare plant and animal species surveys were conducted on NSB Kings Bay to identify threatened, endangered, and rare species potentially occurring on NSB Kings Bay. These surveys were updated by conducting additional surveys in 2003 and 2004 (Figures 3-3a through 3-3f). The surveys identified 19 plant species, three terrestrial animal species, and nine endangered, threatened, and rare aquatic animal species potentially on the installation.

3.6.1 Federally and State Protected Plant Species

There are potentially 12 plant species on NSB Kings Bay which are currently designated as state-listed threatened, species of special concern, or regionally rare (Table 3-7). No plant species identified on the installation were provided Federal protective status. Of the state-listed plant taxa, three are identified as threatened and three are considered species of special concern. Detailed information about these species and their management on NSB Kings Bay is provided in Section 4.3.3.2. Locations of rare plants on NSB Kings Bay are presented in Figure 3-7.

Table 3-7. State-Listed Plant Taxa Occurring on NSB Kings Bay, Georgia.

Scientific Name (Common Name)	State Status	Location
Asimina pygmaea (Dwarf pawpaw)	RR	Pine flatwoods communities.
Eleocharis albida (White spikerush)	RR	Mucky bottoms and sandy bars along tidal creeks, and weedy sites altered by humans.
Epidendrum conopseum (Green-fly orchid)	SSC	Typically on *Quercus virginiana* and *Magnolia grandiflora*, in maritime forests with increased humidity.
Pteroglossaspis ecristata (Wild coco)	RR	Open, dry, annually mowed field with introduced pasture grasses.
Forestiera segregata (Florida privet)	RR	One population on a low mound surrounded by salt marsh.
Litsea aestivalis (Pond spice)	T	Deciduous bay heads and edges of sandy sinkholes and ponds.
Quercus austrina (Bluff white oak)	RR	Single plant along the edge of a paved road.
Quercus chapmanii (Chapman oak)	RR	Evergreen scrub forests and pine flatwoods communities.
Sageretia minutiflora (Tiny-leaf buckthorn)	T	Two sites: in shade under well-developed canopy and in full sun in an area disturbed by humans.

Table 3-7, continued.

Sarracenia minor (Hooded pitcher plant)	SSC	Wetland margins and pine flatwoods.
Tillandsia bartramii (Bartram's air plant)	SSC	Maritime forest community with increased humidity on *Quercus virginiana.*
Tillandsia recurvata (Ball moss)	T	Maritime forest community with increased humidity on *Quercus virginiana.*

Key: SSC = Species of Special Concern, T = Threatened, RR = Regionally Rare

3.6.2 Federally and State-Protected Terrestrial Vertebrates

Vertebrate surveys on NSB Kings Bay identified five terrestrial faunal threatened or endangered species or species of special concern within or approached by NSB Kings Bay (Table 3-8). Detailed information on species locations and populations on NSB Kings Bay is provided in Section 4.3.3.2 and locations of rare terrestrial vertebrates on NSB Kings Bay are presented in Figure 3-4.

Suitable habitat is present on NSB Kings Bay for several other Federal and state-protected vertebrate species although they have never been identified during biological surveys. Suitable habitat is present for the swallow-tailed kite (*Elanoides forficatus*, no Federal status, state rare), bald eagle (*Haliaeetus leucocephalus*, Bald and Golden Eagle Protection Act, state threatened), red knot (*Calidris canutus* ssp. *rufa*, Federal candidate, state rare), striped newt (*Notophthlamus perstriatus*, Federal candidate, state threatened), and the round-tailed muskrat (*Neofiber alleni*; no Federal status, state threatened).

Table 3-8. Federal and State Rare Terrestrial Vertebrate Species Occurring on NSB Kings Bay, Georgia.

Scientific Name (Common Name)	Federal Status	State Status	Habitat
Gopherus polyphemus (Gopher tortoise)	C	T	Well drained, sandy soils in forested and grassy areas.
Drymarchon couperi (Eastern Indigo Snake)	T	T	Well drained, sandy soils. Confirmed at the Solar Farm.
Sterna antillarum (Least Tern)	N	R	Shoreline and along riverbanks. Nest on dry, exposed sandbars.
Scriurus niger shermani (Sherman's Fox Squirrel)	N	SSC	Mesic/scrubby flatwoods, upland pine forests.
Falco sparverius paulus (Southeast American Kestrel)	N	R	Open/partly open habitats (some scattered trees).
Mycteria americana (Wood stork)	E	E	Cypress and other wooded swamps.

Key: C = Candidate, E = Endangered, N = Not currently listed, T = Threatened, SSC = Species of Special Concern

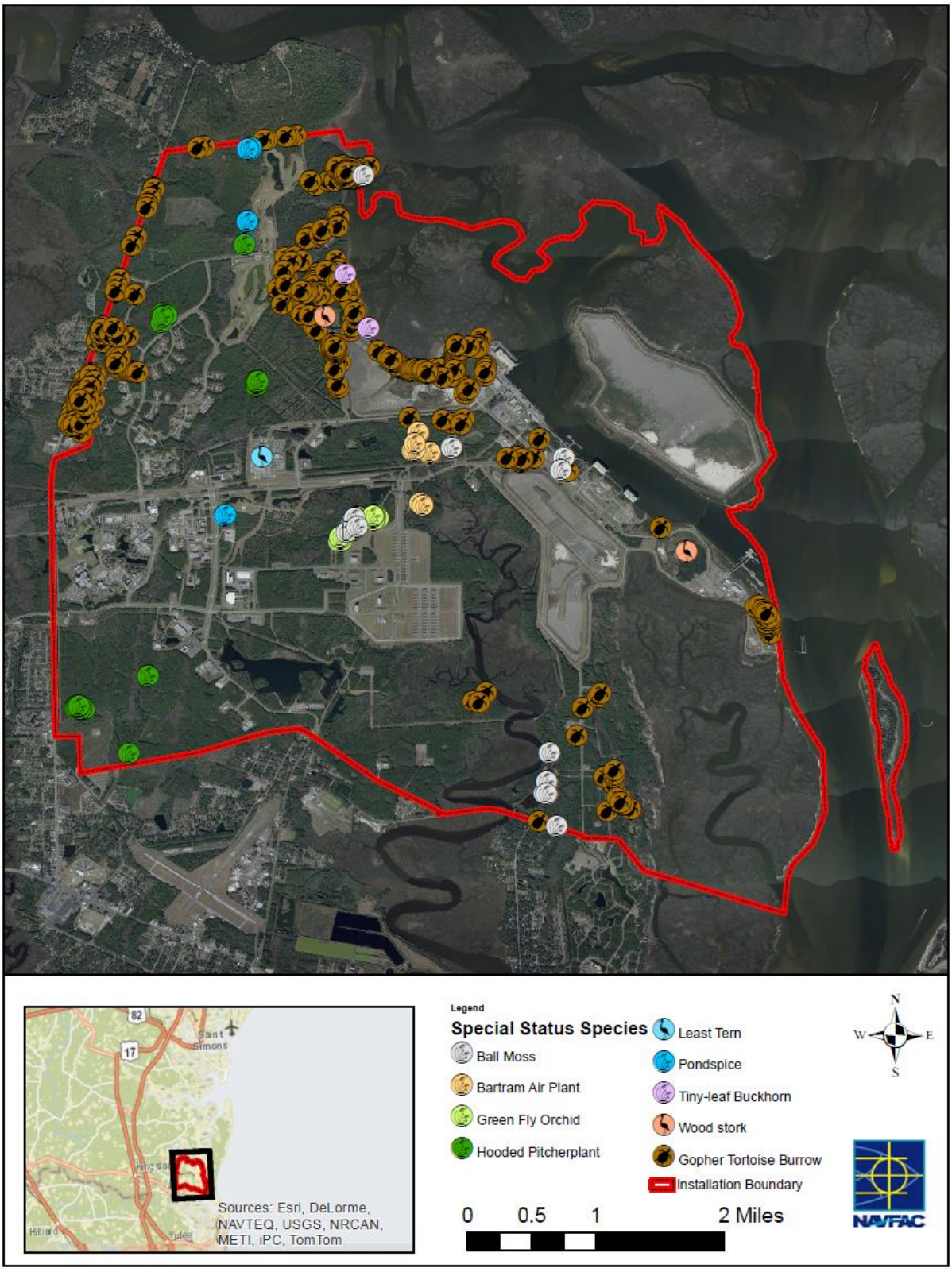

Figure 3-4. Locations of Rare Plants and Terrestrial Vertebrates at NSB Kings Bay

3.6.3 Federally and State-Protected Aquatic Species

Vertebrate surveys identified nine aquatic threatened or endangered species or species of special concern within or approached by NSB Kings Bay (Table 3-9). Each of these species is granted state and Federal protective status. Detailed information on species locations and populations on NSB Kings Bay is provided in Section 4.3.3.2.

The Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) has a complex anadromous life cycle. Adults typically reside in marine environments, but migrate into their natal freshwater river for spawning. The shortnose sturgeon (*Acipenser brevirostrum*) is amphidromous; adults typically reside in the fresh and brackish waters of their natal rivers, but will occasionally migrate to marine waters for brief periods, usually during the cooler seasons. Spawning for both species occurs upriver over hard bottom habitats. After hatching, juveniles migrate downstream to brackish habitats below the head of tide where they co-occur with adult shortnose and juvenile Atlantic sturgeon. A sturgeon survey was conducted below the head of tide in the St. Marys River in 2013-16 using nets and acoustic telemetry using a stationary array of receivers. Twenty-five Atlantic and four shortnose sturgeons were captured in the nets. The acoustic array recorded a total of 46,548 Atlantic sturgeon and 6,850 shortnose sturgeon detections from acoustically tagged sturgeons, although all of the shortnose sturgeon were detected in the St Marys River, with none detected in Cumberland Sound (Fox and Peterson 2017).

Suitable habitat is present on NSB Kings Bay for other federal- and state-protected aquatic species, such as the smalltooth sawfish (*Pristis pectinata*, federally-endangered, state-endangered) and giant manta ray (*Manta birostris*, federally-threatened, no state status), although they have never been identified during biological surveys adjacent to the installation in Cumberland Sound.

Marine mammals, including the ubiquitous bottlenose dolphin (*Tursiops truncatus*), are protected under the Marine Mammal Protection Act (MMPA). There are two levels of "take" under the MMPA: Level A take encompasses injury or death of the animal; Level B take includes many form of harassment, which has been interpreted to include sound-in-the-water from activities such as pile driving. NOAA Fisheries has provided criteria for mathematically determining the maximum distance to which sound-in-the-water may travel and constitute a Level B take. Installations may be able to mitigate these takes to zero by implementing a marine mammal observer plan that ensures a shut-down of relevant activities if a marine mammal comes within that distance. Alternatively, the action proponent may pursue an incidental harassment authorization (IHA) for the required number of Level B takes, but an IHA cannot be issued unless an Environmental Assessment (EA) is prepared.

Table 3-9. Federal and State Rare Aquatic Vertebrate Species in Vicinity of NSB Kings Bay, Georgia.

Scientific Name (Common Name)	Federal Status	State Status	Habitat
Trichechus manatus (West Indian manatee)	E	E	Coastal waters, estuaries, and warm water outfalls.
Balaena glacialis (North Atlantic right whale)	E	E	Coastal waters, mouth of the river.
Chelonia mydas (Green sea turtle)	T	T	Migrates through Georgia coastal waters.
Dermochelys coriacea (Leatherback sea turtle)	E	E	Migrates through Georgia coastal waters.
Eretmochelys imbricata (Hawksbill sea turtle)	E	E	Migrates through Georgia coastal waters.
Lepidochelys kempi (Kemp's Ridley sea turtle)	E	E	Migrates through Georgia coastal waters.
Megaptera novaeangliae (Humpback whale)	E	E	Migrates through Georgia coastal waters.
Caretta caretta (Loggerhead sea turtle)	T	T	Nests on barrier islands, forages in ocean/channels.
Acipenser brevirostrum (Shortnose sturgeon)	E	E	Rivers and estuaries .
Acipenser oxyrhynchus (Atlantic sturgeon)	E	N	Rivers and estuaries.
Pristis pectinata (Smalltooth sawfish)	E	E	Coastal waters (extreme northern extent of range).
Manta birostris (Giant manta ray)	T	N/A	Coastal waters.

Source: Listed Species in Camden County, GDNR 2006.

Key: T = Threatened E = Endangered P = Petitioned.

3.7 Invasive Plant Species

The most recent invasive plant species ground survey of NSB Kings Bay was conducted in 2017. The survey focused on disturbed areas along roads, trails, housing sites, developed areas, ditches and power lines. Table 3-10 provides a list of the non-native invasive plant species found on NSB Kings Bay in surveys conducted since 2003. The most recent locations of invasive plants, identified in 2017, are depicted in Figure 3-5.

Table 3-10. Non-Native Invasive Plants Occurring at NSB Kings Bay, Georgia.

Alligator Weed (*Alternanthera philoxeroides*)

Camphor Tree (*Cinnamomum camphora*)

Chinaberry (*Melia azadarach*)

Chinese Tallow (*Triadica sebifera*)

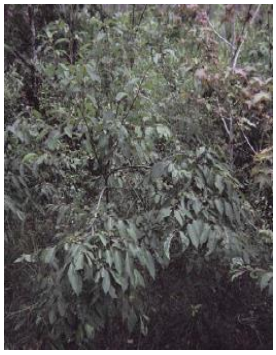

Fig (*Ficus* sp.)

Japanese Honeysuckle (*Lonicera japonica*)

Lady palm (*Raphis excelsa*)

Mimosa (*Albizia julibrissin*)

Rose (*Rosa* sp.)

Tamarix (*Tamarix cannariensis*)

Torpedo Grass (*Panicum repens*)

Woodrush Flatsedge (*Cyperus entrerianus*)

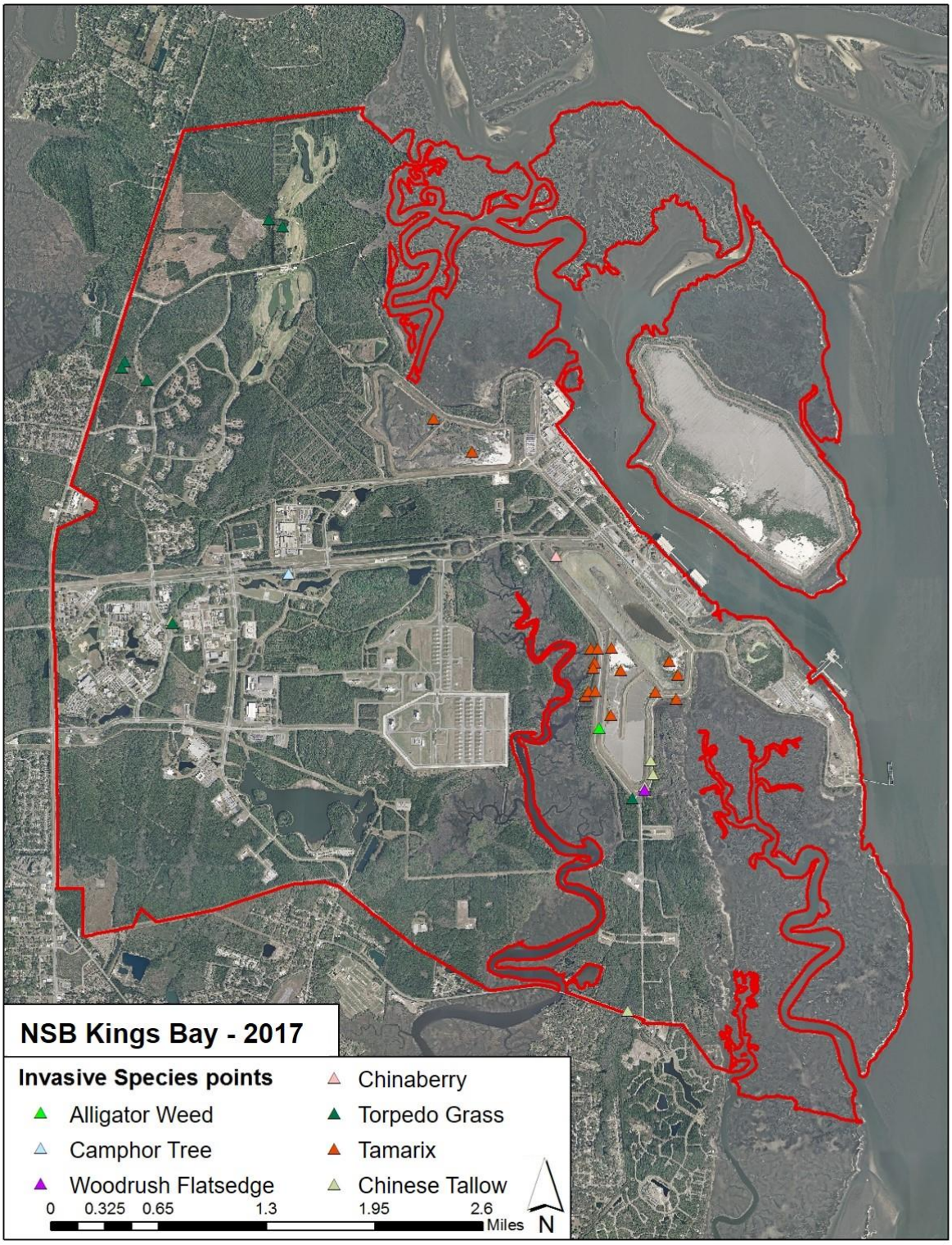

Figure 3-5. Locations of Invasive Plant Species Identified on NSB Kings Bay in 2017.

3.8 Land Use

3.8.1 General

3.8.1.1 NSB Kings Bay Land Use

Presently, NSB Kings Bay occupies 16,168 acres of land, which have been divided into four general categories based on operational needs and the intensity of required maintenance (Table 3-11). *Improved grounds* include areas on which landscaping and maintenance measures are performed primarily for aesthetic purposes, and areas are mowed for security purposes. Ground cover in these areas is predominantly Bermuda, Bahia, centipede, and native grasses. Improved lands occur over approximately 1,700 acres or 11 percent of the total installation. Improved lands may be further classified into existing land use categories, which include three major functional areas: the Waterfront Operations Area, the Industrial Support/Strategic and Defensive Weapons Area, and the Personnel Support Family Housing Area.

Table 3-11. Categories of Installation Land Use by Acreage.

Category	Acreage	Percentage
Improved Grounds	1,700	11
Semi-Improved Grounds	300	2
Unimproved Grounds	9,290	57
Other	4,896	30
Total	**16,168**	**100**

The Waterfront Operations Area encompasses 150 acres for active uses and stretches along Kings Bay into Cumberland Sound between the Marianna Creek marshes and estuaries to the north and Mill Creek and marsh areas to the south. This area incorporates all land uses related to the TRIDENT Submarine, refit areas, explosives handling areas, the port services complex, Poseidon Tender, and a Magnetic Silencing Facility. *The Industrial Support/Strategic and Defensive Weapons Area* occupies the central portion of NSB Kings Bay and provides basic operational support functions and services, including Public Works, General Base Supply, the Refit Industrial Area, the Strategic Weapons Facility, the Defensive Weapons Facility, and the Police Station. *The Personnel Support Family Housing Area* is located on the western ridge adjacent to State Road Spur 40 and includes dining facilities, recreation complexes, library, bank, exchange, retail stores, and family housing.

Semi-improved grounds include areas where landscaping and maintenance are performed primarily to provide erosion-resistant vegetation, to control weeds and brush, and to reduce fire hazards. Semi-improved lands occur over approximately 300 acres or 2 percent of the installation.

Unimproved grounds include other unpaved areas not included in the improved or semi-improved classification and on which no maintenance is performed. Unimproved areas include both forested and non-forested areas and occur over approximately 9,290 acres or 57 percent of the installation.

Other lands include areas occupied by buildings, runways, streets, parking areas, sidewalks, and other paved areas and occur over approximately 4,896 acres or 30 percent of the installation.

One *installation restoration site* is located on NSB Kings Bay (Figure 3-6) and is the site of a former county landfill. Active cleanup efforts at the landfill were started in August 1992.

3.8.1.2 Forestry

NSB Kings Bay contains a total of 5,141 acres of forested area. All NSB Kings Bay forest stands were inventoried in 1988 and stored as a Forest Management Inventory System (FMIS) database for use in the overall management of their forestry resources. Appendix B provides all individual stand inventory data for NSB Kings Bay. Individual stand locations and compartments are shown on Figures 3-7a through 3-7f. Based on the most current inventory of forest stands on NSB Kings Bay, approximately 78 percent of the installation's forest resources are in pine/softwoods, with only 22 percent in hardwoods.

3.8.2 Regional Land Use and Coastal Zone Program and Acts

The NSB Kings Bay region is experiencing rapid growth and development and it is likely that this trend will continue into the future. The population of Camden County in 2010 was 50,513 and it is expected to have grown approximately 5% as of 2017 (U.S. Census Bureau 2018). Population increases contribute to increased residential and commercial development located along SPUR 40 (borders NSB Kings Bay to the west), and other developable areas throughout Camden County.

New waterfront developments and marina facilities south of NSB Kings Bay have increased the number of recreational boats in the area and could encroach on NSB Kings Bay operations. Further expansions of these private facilities are planned in the future. Marine encroachment is an ever increasing problem for NSB Kings Bay.

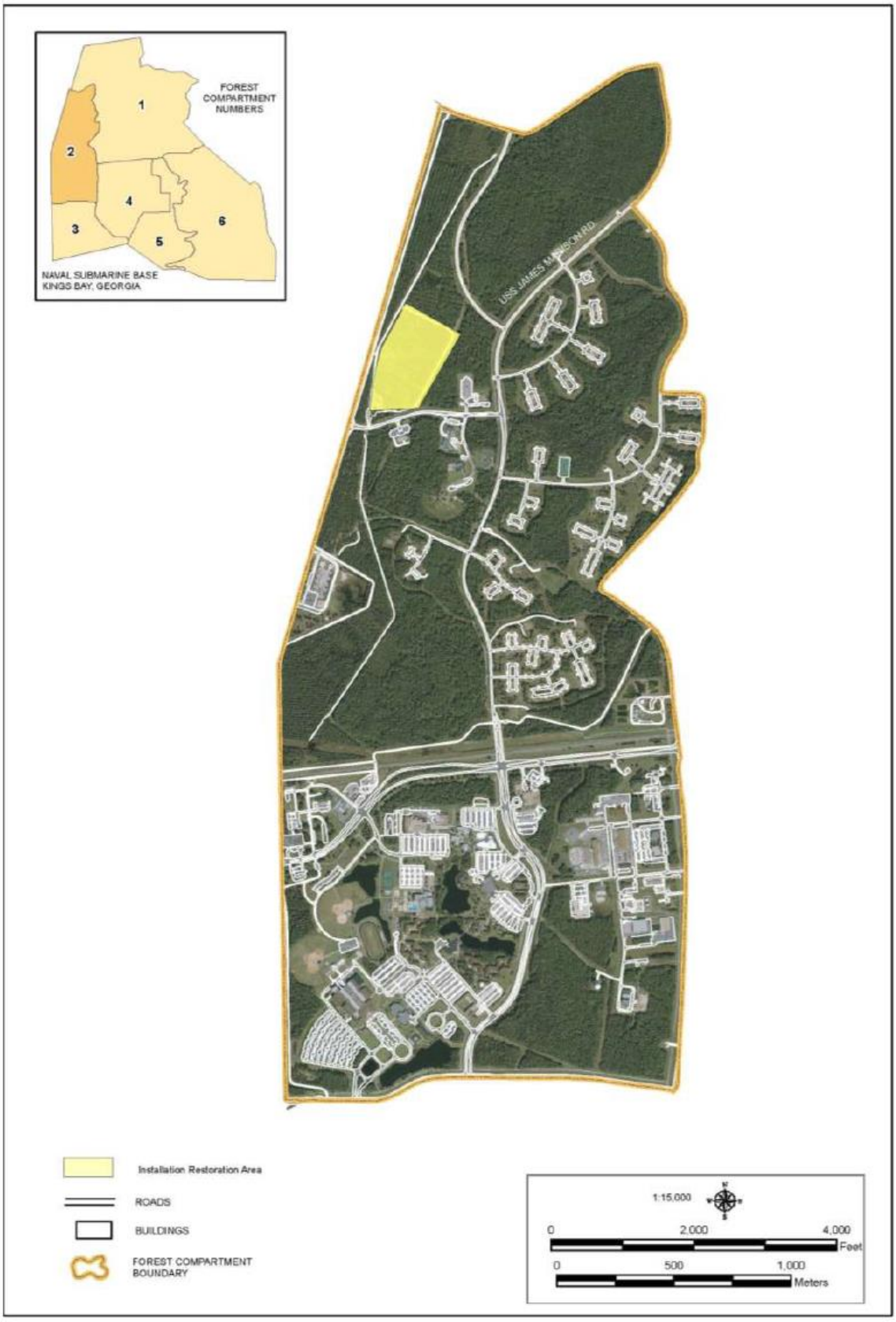

Figure 3-6. Restoration Site at Naval Submarine Base (NSB) Kings Bay, Georgia.

Figure 3-7a. Forest Stands in Compartment 1 on Naval Submarine Base Kings Bay, Georgia.

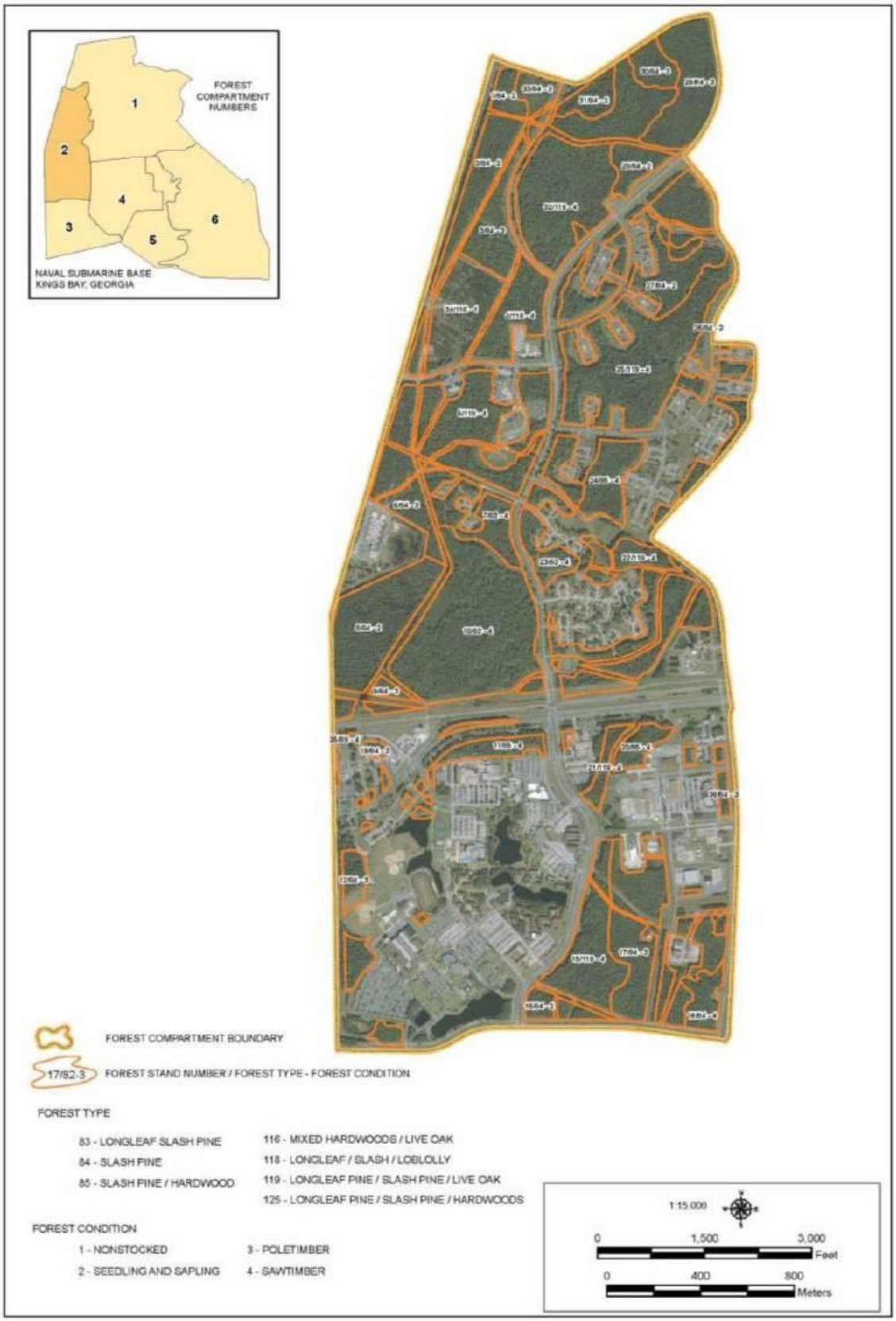

Figure 3-7b. Forest Stands in Compartment 2 on Naval Submarine Base Kings Bay, Georgia.

Figure 3-7c. Forest Stands in Compartment 3 on Naval Submarine Base Kings Bay, Georgia.

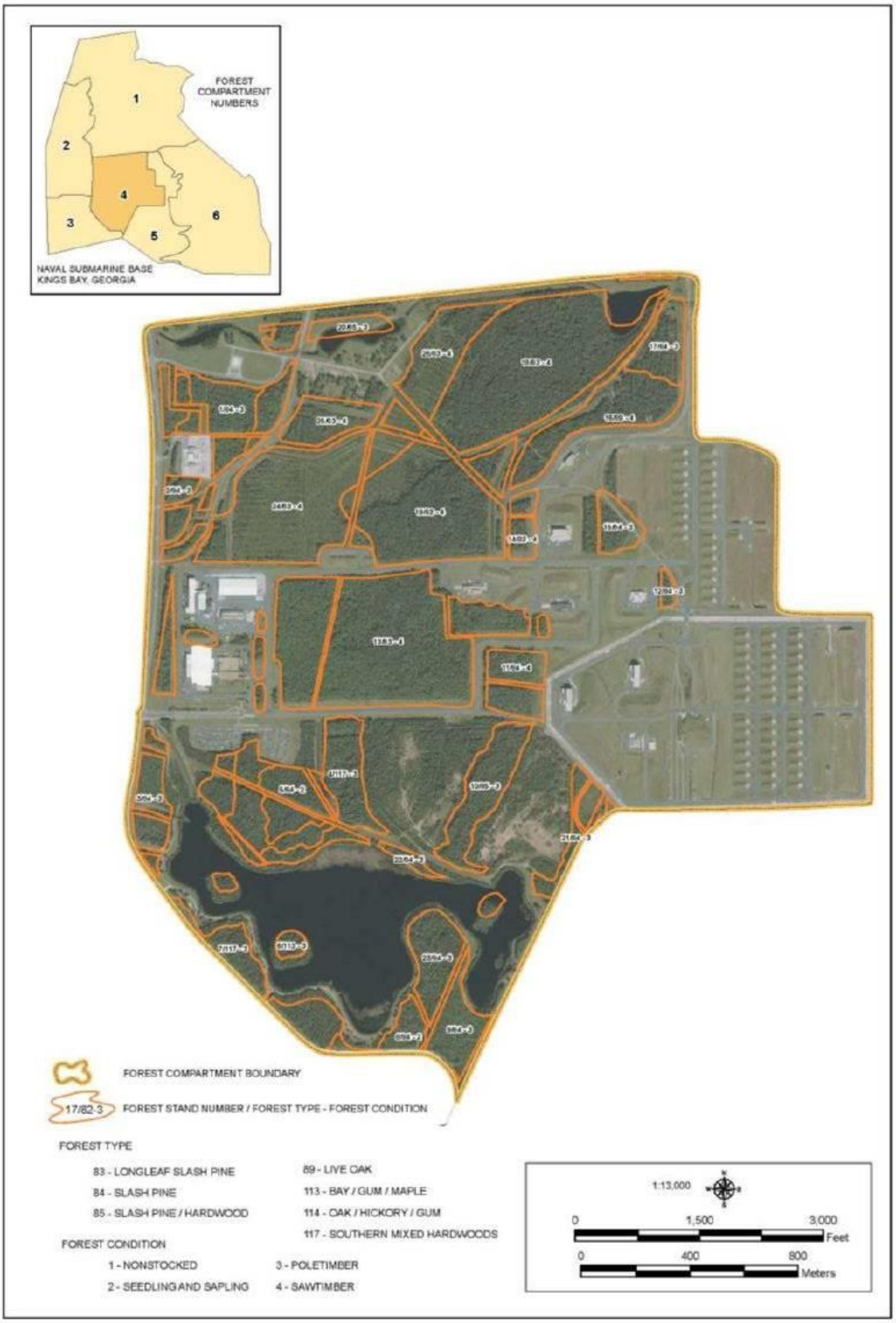

Figure 3-7d. Forest Stands in Compartment 4 on Naval Submarine Base Kings Bay, Georgia.

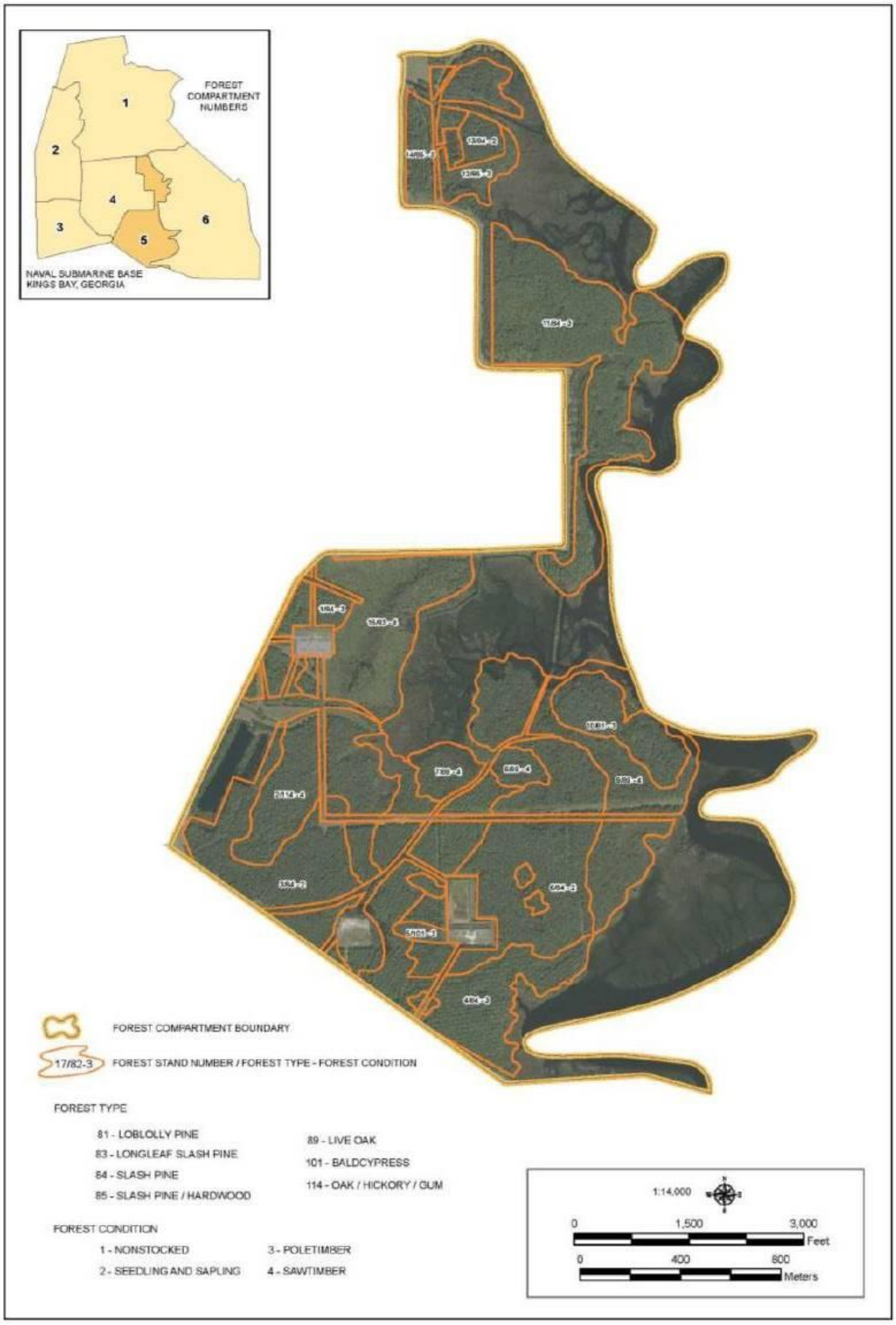

Figure 3-7e. Forest Stands in Compartment 5 on Naval Submarine Base Kings Bay, Georgia.

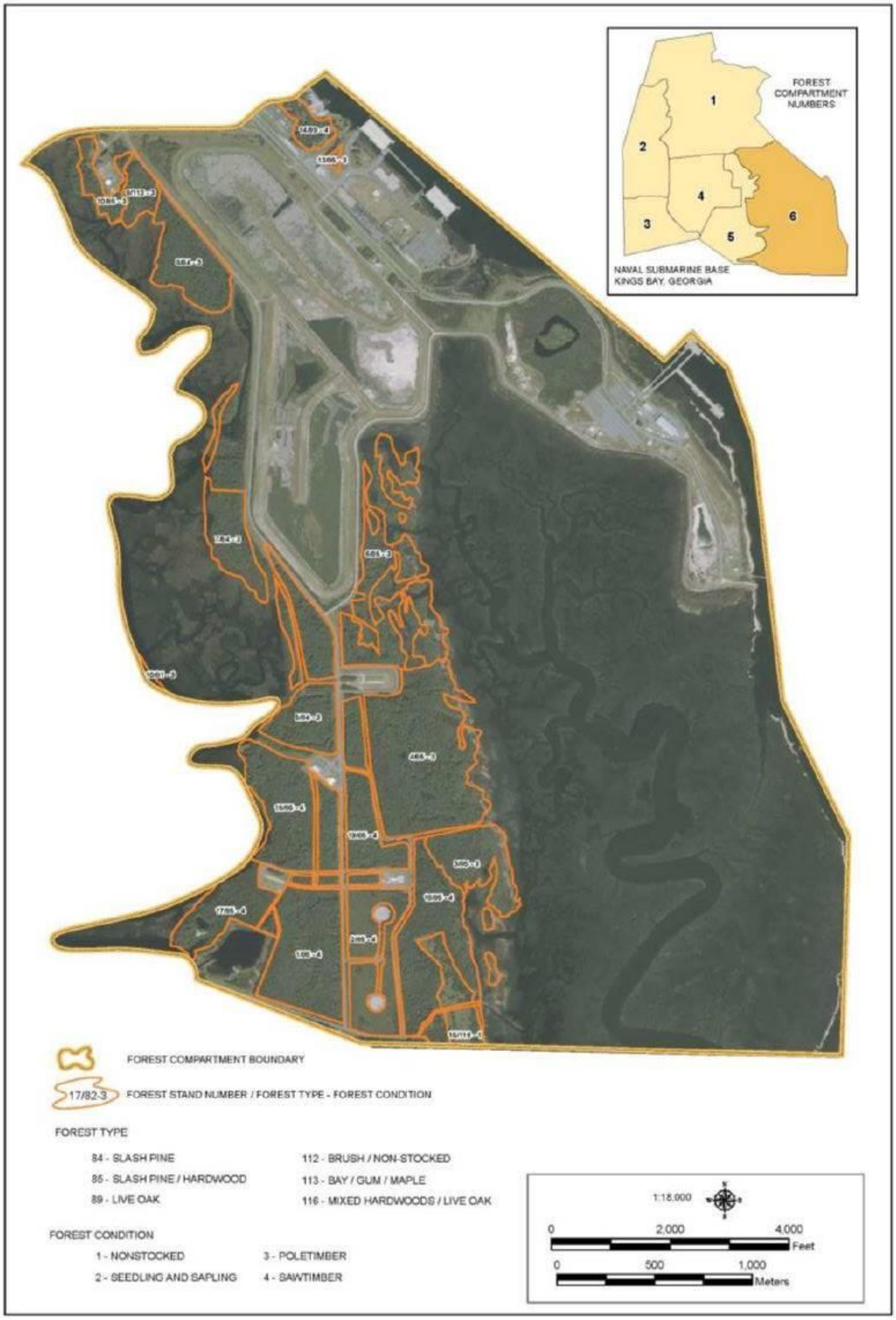

Figure 3-7f. Forest Stands in Compartment 6 on Naval Submarine Base Kings Bay, Georgia.

3.8.2.1 Coastal Zone Program and Acts

The state of Georgia implemented the Georgia Coastal Management Program (GCMP) in 1997 and it is administered by the GDNR. The GCMP is an integrated, networked program, which facilitates coordination among all state agencies to protect coastal resources. The primary goal of this program is to attain a balance between environmental conservation and economic development through guidance in public access, green growth and sustainable communities, coastal hazards and disaster resiliency, living shorelines and wetlands, and grants and contracts. Further information is available at http://coastalgadnr.org/CoastalManagement. Other legislation implemented to protect coastal resources includes the Georgia Shore Protection Act and the Georgia Coastal Marshlands Protection Act.

3.8.2.1.1 Georgia Shore Protection Act

The Shore Protection Act of 1979 is the primary legal authority for protection and management of Georgia's shoreline features, including sand dunes, beaches, sandbars, and shoals, collectively known as the sand-sharing system. This act protects these shoreline features by limiting construction activity; prohibiting motorized vehicles on dunes and beaches; prohibiting docks, marinas, boat ramps, and storage facilities on dunes; and establishing the Shore Protection Committee. The Shore Protection Committee evaluates proposed construction or development projects, and associated potential impacts on area dunes, beaches, sandbars, and shoals.

3.8.2.1.2 Georgia Coastal Marshlands Protection Act

The Coastal Marshlands Protection Act of 1970, amended in 1992, recognizes Georgia's marshlands as vital natural resources. The act provides protection to tidal wetlands; requires permits for structures (*e.g.*, marinas, community docks, boat ramps, recreational docks, and piers), and dredging and filling; and establishes the Coastal Marshlands Protection Committee. The Coastal Marshlands Protection Committee evaluates proposed construction or development projects and associated potential impacts on area marshlands, and grants or denies permits for reviewed projects based on their environmental impacts and the public interest.

3.9 Recreational Resources

3.9.1 NSB Kings Bay Outdoor Recreational Resources

The MWR department of NSB Kings Bay is the primary entity responsible for maintaining and developing outdoor recreational activities, while the Natural Resources division manages the land necessary for siting outdoor recreational opportunities. Because of this interface, a close working relationship is required and is exhibited on NSB Kings Bay. This is prevalent during the initial

planning and siting of DoD and military recreational facilities. For instance, when MWR identifies the need for a particular project, the Environmental Department is contacted for assistance with the development and protection from any degradation associated with site development. Additional approval must be obtained from the planning board and the utilities board before construction.

MWR presently sells state hunting and fishing licenses and base permits; rents non-motorized boats for use on approved ponds; rents fishing gear and tree stands for hunting; and distributes maps and information on the programs. Current outdoor recreation activities at NSB Kings Bay include picnicking, archery, recreational gardening, jogging, hunting, fishing, bicycling, and non-motorized boating and are available to all military and DoD personnel as well as two guests per visit (see Section 1.6.6).

MWR also organizes trips and provides transportation to off-base destinations for canoeing (St. Marys River), horseback riding (St. Simons Island), and skiing (North Carolina). Water resources available for recreational activities include more than 200 acres of freshwater ponds; one of these freshwater ponds is the 120-acre Lake D. In addition, saltwater resources are available for outdoor recreation; however, access is limited by security restrictions. Additionally, an 18-hole golf course is located on NSB Kings Bay (Figure 3-8).

The undeveloped southwestern portion of the installation has numerous natural resources. Because this area is part of a comprehensive multiple-use management program, encompassing timber production, fish and wildlife habitat, and watershed protection, demonstration projects will be considered to demonstrate the multiple-use management concept. The area also provides education, research, and outdoor recreational opportunities.

Access to portions of the installation's recreational resources is limited to uniformed military persons and their dependents, retired military personnel, and DoD civilians. However, NSB Kings Bay has shared recreational opportunities with the general public only in the northern portion of the installation in Etowah Park, housing areas and at the golf course.

3.9.2 Regional Outdoor Recreational Resources

A wide array of recreational opportunities is offered within close proximity to NSB Kings Bay. Numerous state parks in southeastern Georgia and northeastern Florida offer fishing, nature study, camping, picnicking, and canoeing opportunities. Hunting, fishing, and trapping are available

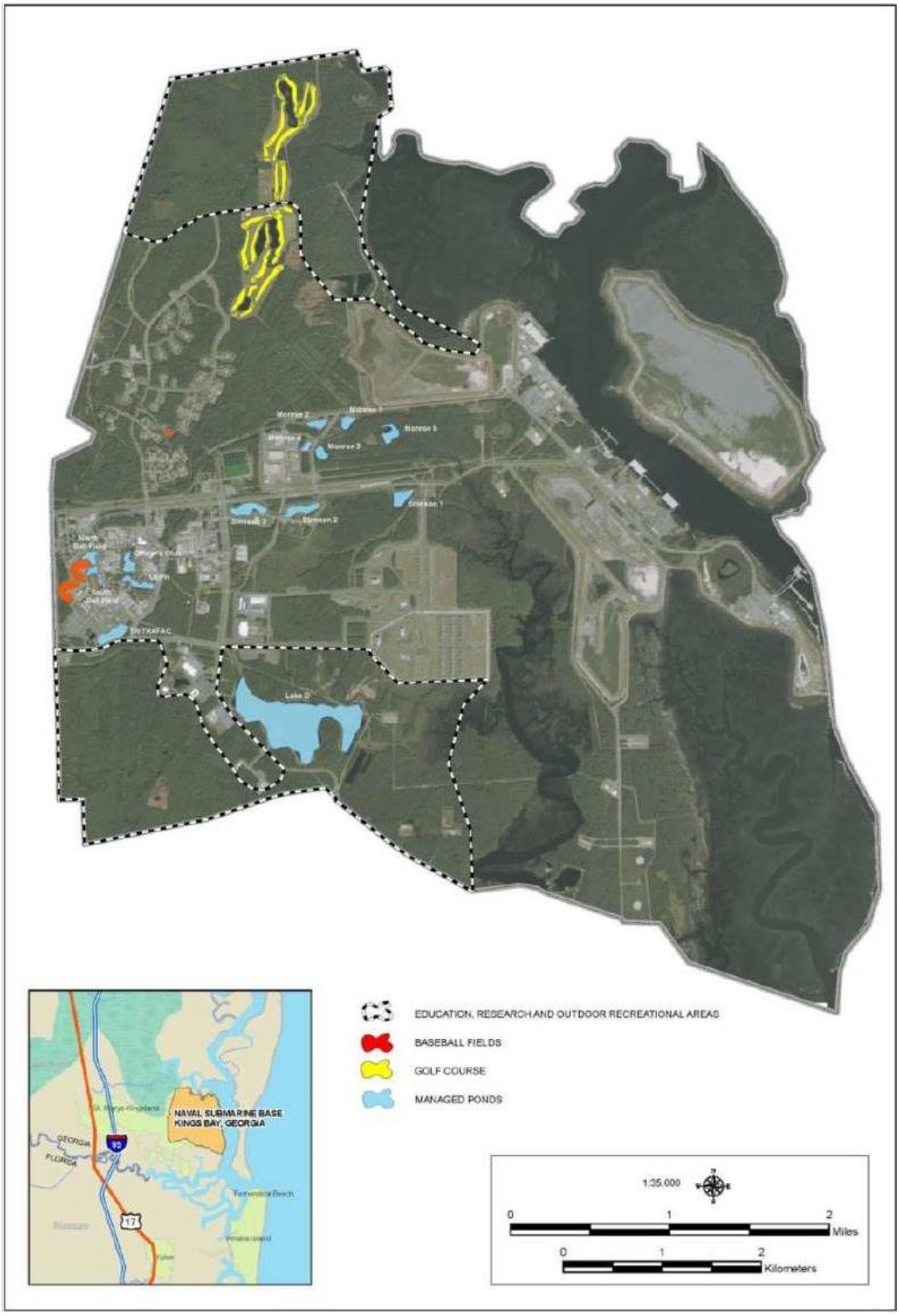

Figure 3-8. Outdoor Recreation at NSB Kings Bay.

at various state wildlife management areas along the Georgia coast and on the Florida side of the St. Marys River. The Okefenokee National Wildlife Refuge provides canoeing, fishing, nature study, and bicycling opportunities. Cumberland Island National Seashore provides excellent hiking and nature study activities. Canoe trails have been established on the St. Marys, Suwanee, and Santa Fe rivers. Swimming and surfing opportunities are available at Fort Clinch and Little Talbot Island state parks in Florida, and Jekyll Island State Park in Georgia.

3.9.2.1 Cumberland Island National Seashore

Cumberland Island is bounded to the west by the Cumberland River, St. Andrews Sound to the north, and Cumberland Sound to the south, and is a unique regional natural resource. The island has 18 miles of beach, which entertain game and sport fishing, as well as other water-based outdoor recreation activities. In addition, these waters provide habitat for the endangered Atlantic and short-nosed sturgeon. Fresh water flows into Cumberland Sound from Crooked River and St. Marys River. The entrance to the sound from the Atlantic Ocean is formed by the St. Marys River, which is identified as the St. Marys entrance, and is both a critical habitat for the West Indian manatee and a vital component of the military mission.

The Cumberland Island National Seashore is located on the eastern side of Cumberland Sound, and provides a natural barrier from storms and flooding for the inland estuaries. Wilderness areas encompass over 8,840 acres, and an additional approximately 11,718 acres of potential wilderness provide numerous opportunities for hiking, camping, and wildlife watching. Because of this designation as a national seashore, visitation has been limited to 300 residents per day to minimize human impacts to Cumberland Island. Island wildlife includes deer, raccoon, gray squirrel, and numerous species of wading birds. Cumberland Island has also been designated as part of the Golden Isles (part of the Atlantic flyway), a designated resting point for migrating birds. In addition, Cumberland Island beaches are among the prime nesting sites in Georgia for the loggerhead and other sea turtles. Waters to the east of Cumberland Island have been designated as critical habitat for the North Atlantic right whale. Additional information on the critical habitat and management efforts of the North Atlantic right whale are addressed in Section 4.3.3.2

3.9.2.2 Crooked River State Park

Crooked River State Park is located on the north side of NSB Kings Bay. The park contains approximately 500 acres of coastal habitat areas, and provides various types of recreation, such as camping, hiking, and swimming. The shared boundary with NSB Kings Bay is primarily longleaf pine forests, which provide habitat for a wide variety of wildlife.

4 Natural Resources Goals, Objectives, and Management Strategies

This section presents the goals, objectives, and management strategies for natural resources at NSB Kings Bay over the next 10-year period. To ensure success in achieving these goals at NSB Kings Bay, a framework or "road map" of goals, objectives, management strategies and initiatives and projects is discussed in this section. The goals, objectives, strategies, initiatives and projects are referenced throughout the INRMP where appropriate and relevant.

Definitions

Goals. Goals are general expressions that represent the long-range aim of management. For this INRMP, goals are compatible with the military mission of NSB Kings Bay and provide conservation and ecosystem management targets and direction.

Issues. To establish objectives for achieving the stated INRMP goals at NSB Kings Bay, issues that must be addressed were identified and are described in Section 4.1. Issues may include the presence, abundance, distribution, function, condition, and sensitivity of a particular natural resource feature, resource-based human function, or other attribute on the installation, or within the broader ecological or community setting. Issues may also include the effectiveness or ineffectiveness of existing or past practices regarding management and use of resources on the installation, and the requirements for regulatory compliance regarding the management and use of natural resources.

Objectives. 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. One or more objectives may be identified for successfully achieving a particular goal. Objectives are comprised of strategies and defined actions or projects.

Strategies. Strategies establish the approach and expected end result for the actions that are necessary to accomplish stated objectives. One or more strategies may be identified for accomplishing a particular objective. Strategies involve certain actions to be taken by the DoN, such as the completion of specific projects and/or the implementation of other management initiatives at NSB Kings Bay. Strategies usually specify timeframes for completion of various actions.

Projects. Discrete actions for fulfilling a particular strategy are identified as projects. Projects may be required to fulfill obligations by NSB Kings Bay in meeting regulatory requirements

regarding natural resources management or may enhance existing measures for ensuring compliance. Other projects are not compliance-driven, but may allow for more effective and efficient management of natural resources and/or simply provide for sound natural resources stewardship. Projects require labor resources and funding, in addition to the day-to-day requirements of the installation.

Other Management Initiatives. Some strategies identify the need for incorporating sound natural resources management principles into the day-to-day decision-making processes and other actions of the various departments at NSB Kings Bay. These types of initiatives typically strive to elevate awareness throughout the NSB Kings Bay organization, avoid potentially reactive approaches to natural resources issues at NSB Kings Bay, and facilitate a proactive approach to addressing natural resources within the mission of the installation. Initiatives are fundamental, non-measurable actions necessary for successful implementation of a strategy. Initiatives attempt to solve problems that preclude meeting specific strategies.

4.1 Goals and Objectives

Four goals have been identified for NSB Kings Bay:

Goal 1 Protect, conserve and enhance the ecological value and diversity of natural resources through fostering knowledge of, and participation in, adaptive ecosystem management.

Goal 2 Protect and maintain the ecosystem at NSB Kings Bay through the continuation and enhancement of ecologically appropriate and beneficial land management practices, while ensuring the expansion and continuation of the military mission.

Goal 3 Protect, maintain, utilize, and restore natural resources.

Goal 4 Provision of facilities and development of policies that allow for passive, recreational uses and environmental education activities that will not adversely affect the natural areas.

Goal 1: Protect, conserve, and enhance the ecological value and diversity of natural resources through fostering knowledge of, and participation in, adaptive ecosystem management in support of the Installation's mission.

Issue

In the past, installation plans and programs for maintaining and managing natural resources on NSB Kings Bay did not fully consider the interrelationships among resources on the installation. Instead, programs and plans frequently focused on the management of individual resources in accordance with Federal or state laws.

Ecosystem management cannot be accomplished solely through the implementation of programs and plans focused on individual resources. A coordinated effort among all programs and

personnel from tenant commands, as well as decision-making authorities on the installation, is required to protect the interdependent components of communities that define an ecosystem. The coordinated effort would address the consequences of actions on related resources, and would resolve conflicts between competing programs and plans for use of the installation's natural resources.

Ecosystem management is a holistic, adaptive-management concept that transcends human-made boundaries, internal and external to NSB Kings Bay. Management for a sustainable ecosystem requires awareness, education and training, and responsible participation of individuals potentially affecting the ecosystem, as well as adjustments in management principles and practices to respond to new knowledge and dynamic conditions.

Objective 1.1: To incorporate the concept of ecosystem management into all planning and management processes.

The Natural Resources staff would provide information to the Facilities Planning Review Board regarding natural resources issues and constraints (*e.g.*, wetlands, floodplains, threatened and endangered species) during facilities siting and management decision-making processes. The Natural Resources staff, would communicate with senior management, and the CO regarding the potential ramifications to the military mission associated with non-compliance of Federal and state natural resources laws and the benefits to the military mission and quality of life for sailors of a well run natural resources program. For further discussion, see military mission impacts in Section 5.

The INRMP will be included in working programs and department plans (*i.e.*, SWPPP, IPM, Grounds Maintenance Plan, and other working plans on the installation) and be a part of the decision-making process for future development and management on NSB Kings Bay. As part of the ecosystem management process, NSB Kings Bay will maintain a working team to integrate the INRMP, SWPPP, IPM, and Grounds Maintenance Plan documents. The team will continue to consist of a representative from each department who is tasked with the responsibility of implementing programs, plans, or policies related to ecosystem management. The Natural Resources Manager should continue to be responsible for the team selection process. The team should meet annually to be sure that all documents continue to be integrated with the INRMP.

NSB Kings Bay would continue to ensure that cooperative agreements, memoranda, or other agreements between the installation, and Federal and state agencies that oversee and regulate natural resources protection are current, and that such agreements have been established with all necessary agencies. It would be the responsibility of the Natural Resources Manager to ensure that NSB Kings Bay has up-to-date agreements. The Natural Resources Manager would consult with foresters and fish and wildlife biologists at NAVFACE SE, as well as with Federal, state, and county wildlife

biologists, foresters, and land managers for assistance. The Natural Resources Manager would also consult with installation commands and departments, such as MWR.

NSB Kings Bay Natural Resources staff would ensure that all tenant command activities impacting natural resources are coordinated through the NSB Kings Bay Environmental Department. This would be accomplished by establishing a tenant environmental committee, which the NSB Kings Bay Natural Resource Manager chairs, to inform tenant commands of environmental issues and review any action that may involve the disturbance of natural resources and by utilizing the Facilities Review Board to review current and future tenant command projects.

Objective 1.2: To implement training, education and stewardship initiatives for ecosystem management.

Proper ecosystem management requires an adequately trained and educated Natural Resources staff. To achieve this objective, NSB Kings Bay would maintain a minimum of two installation personnel trained and certified in prescribed burn management and would maintain an ecosystem management awareness and training/education program available to all interested NSB Kings Bay personnel.

To increase the awareness of the importance of ecosystem management, NSB Kings Bay would continue to implement programs and initiatives that foster citizen participation in ecosystem education and stewardship and would participate in regional stewardship/research programs that foster citizen participation in ecosystem education and stewardship.

Objective 1.3: To maintain a planning team to review and update the INRMP in accordance with OPNAV M-5090.1D, 12-3.4.

This INRMP is intended to be a dynamic, evolving planning document; frequent updates are required to ensure compliance with current regulations and to initiate requests for project funding. The INRMP, and the projects to be implemented to address the goals and objectives for natural resources management at NSB Kings Bay, will be reviewed annually. At each annual review, the installation will evaluate the effectiveness of the INRMP, the progress of each of the projects, and new projects that are necessary to better meet the resource management goals and objectives. This annual evaluation must be completed with the cooperation of the USFWS and GDNR. At the end of each annual review, the INRMP will be updated appropriately, and revised versions of the INRMP distributed to the field-level offices and the USFWS and GDNR.

Goal 2: Protect and maintain the ecosystem at NSB Kings Bay through the continuation and enhancement of ecologically appropriate and beneficial land management practices, while ensuring the expansion and continuation of the military mission.

Issue

As development and training activities have greater potential to affect a greater amount of the land area on NSB Kings Bay, land management decisions and practices will become increasingly important aspects of ecosystem management. The use and management of lands for military mission needs, and the decision-making process regarding such land use, directly affect the sustainability of the ecosystem. To restore and maintain a viable ecosystem, NSB Kings Bay needs to:

- Continue to implement and update as appropriate, an overall management strategy for the management of stormwater runoff and soil erosion to protect surface water bodies and wetlands.
- Support the needs of the military mission while protecting the undisturbed acreage within the 100-year floodplain on NSB Kings Bay.
- Ensure appropriate site selection and construction methods to avoid impacts associated with arbitrarily located human-made linear and nonlinear features. The arbitrary location of features undermines ecological processes through the separation and isolation of wildlife and plant populations, which can render the fragmented parcels unsustainable for wildlife. Arbitrary location of features also increases costs associated with daily land management practices and infrastructure improvements.
- Minimize landscaping costs while complementing and reinforcing the unique coastal environment.
- Ensure that invasive and exotic faunal species do not interfere with military and recreational activities or the quality and functions of wildlife habitats, forests, wetlands, or other ecosystem resources and processes.
- Evaluate future agricultural outlease opportunities on the installation.
- Ensure that land management and land use decisions comply with all applicable laws, executive orders, regulations, directives, and memoranda.

Objective 2.1: To reduce and/or remove exotic and/or nuisance wildlife; and to control wildlife diseases that may adversely affect human health or welfare, the health of the ecosystem, or the military mission.

Numerous exotic species occur on the installation and the control of these pests and exotics is an integral ecosystem management practice on NSB Kings Bay. NSB Kings Bay would periodically update the existing IPM plan to incorporate the most recent research on monitoring and forecasting

methods and removal of exotic faunal pests on the installation. NSB Kings Bay would use education and research, as well as training, for on base land managers.

NSB Kings Bay would continue to monitor the health and populations of game and non-game species to ensure that wildlife do not become a nuisance to the installation or to the surrounding region. NSB Kings Bay would institute monitoring programs to determine population levels and the effective management practices for all game and non-game wildlife species. Monitoring would range from simple inventories each year to maintaining statistics and measurements of all game species taken on the population to ensure the health and quality of the species.

Objective 2.2: To continue existing and to establish new programs and procedures to maintain and enhance water quality.

Maintaining and improving water quality is important to ecosystem function and management. NSB Kings Bay would continue to implement and update when necessary, the long-term management plan to protect and conserve the natural functions of wetlands and shoreline areas, including limiting wetland shoreline destruction and reducing adverse impacts to water quality. NSB Kings Bay would periodically evaluate its stormwater management program and activities contributing to stormwater runoff and/or pollutant loading in stormwater runoff and evaluate its soil erosion control management program annually. NSB Kings Bay would strive to reduce the rate of soil erosion through the implementation and maintenance of long-term measures and projects.

The use of pesticides and fertilizers on NSB Kings Bay would be inventoried. NSB Kings Bay would continue to assess alternatives to, and a reduction in, pesticide and fertilizer use. The intent is to reduce chemical pesticide and fertilizer use to help protect water quality.

Objective 2.3: To minimize the number of structures placed within the 100-year floodplain.

Maintaining the 100-year floodplain in a natural state improves water quality and flood attenuation on NSB Kings Bay. NSB Kings Bay would review all proposed activities for impact avoidance to the attenuation capacity of the 100-year floodplain. If it is determined that development is necessary within the 100-year floodplain to support the military mission, development should first be located in the previously disturbed areas of the floodplain.

Objective 2.4: To implement environmentally beneficial landscaping by reducing the need for irrigation, pesticides, and fertilizers.

NSB Kings Bay would increase the number of natural areas on the installation as opportunities arise and should utilize native species for new landscaping.

Objective 2.5: To minimize adverse impacts to the natural environment when using lands in support of the military mission.

NSB Kings Bay would continue to implement existing policies to minimize adverse impacts to ecosystem resources from land disturbance activities (*e.g.*, clearing, training).

Goal 3: Protect, maintain, utilize, and restore natural resources.

Issue

On NSB Kings Bay, as in the surrounding region, human activities have effectively removed most of the native vegetative communities, including the longleaf pine-wiregrass community. Most of the region's native longleaf pine communities have been adversely affected by human activities, including forestry, agriculture, building development, and decades of fire suppression.

The longleaf pine-wiregrass community is a desired community because it is one of the most biodiverse forest ecosystems. In addition to restoring a highly desirable tree species, restoration of the native longleaf pine community would enhance habitat for the gopher tortoise and other bird and terrestrial vertebrate species.

As a result of the population and economic growth of the region, environmental resources on the installation will provide pristine habitat for birds and terrestrial vertebrates. Consequently, the installation would need to establish, implement, and enforce appropriate measures to ensure the protection of these habitats. If not protected, this area could become intensely developed and pristine habitat lost. Such development would result in the fragmentation of habitat, and the decline of much of the native communities.

Objective 3.1: To maintain ecological integrity by ensuring the long-term viability of native wetland and upland biological communities for the protection of all wildlife.

NSB Kings Bay will implement timber stand and wildlife improvement practices to enhance habitat functions, maximize sustained yield, enhance multiple use management, reduce the potential for wildfires, and control diseases and insect pests. Water quality protection and maintenance will continue for support of wetlands, freshwater ponds, Kings Bay and Cumberland Sound.

Objective 3.2: NSB Kings Bay will conserve and manage threatened and endangered species and species of concern with a goal of no reduction in species numbers or population sizes.

Federal and state listed threatened and endangered species, species of concern, neotropical migratory bird species and rare species all occur on NSB Kings Bay and are important components of the ecosystem management for the installation. NSB Kings Bay would continue to update species surveys as necessary to manage for these species and habitat and will implement programs and activities for the protection and enhancement of all habitat for animal and plant species.

Objective 3.3: NSB Kings Bay will utilize effective management techniques to sustain essential habitat and populations of fish and game species.

The management of game fish and wildlife populations is important to ecosystem management at NSB Kings Bay. To maintain game fish and wildlife populations, NSB Kings Bay would continue to implement appropriate monitoring and training strategies and programs for fish and game species habitat enhancement to ensure the provision of healthy sustainable fish and game species populations. The management of specific areas for game species on NSB Kings Bay will be in cooperation with GDNR and USFWS.

Objective 3.4: NSB Kings Bay will enhance, protect and conserve installation freshwater fishery resources.

Freshwater fishery resources on NSB Kings Bay are primarily limited to man-made lakes that are also used for stormwater retention. To protect and enhance the freshwater fishery resources, NSB Kings Bay would continue to implement appropriate measures to protect the water quality of installation fishery resources. NSB Kings Bay would effectively harvest, monitor, and stock fish populations to ensure healthy sustainable fish populations. When necessary, work may be conducted with technical assistance from wildlife biologists from GDNR or USFWS.

Goal 4: Provision of facilities and development of policies that allow for passive recreational uses and environmental education activities that will not adversely affect the natural areas nor conflict with mission or security needs.

Issue

The SAIA requires that military installations evaluate the potential for providing outdoor recreational resources to the general public. Outside of Etowah Park and base housing areas, current access to the NSB Kings Bay's existing recreational resources is limited to installation DoD civilians, uniformed military person and dependents, and retired military personnel. Although some public access is allowed within the northern portion of NSB Kings Bay, public access to most of the installation is limited due to the needs of the military mission.

Objective 4.1: To continue to address the long-term recreational needs of NSB Kings Bay, and NSB Kings Bay's capability to provide recreational and educational opportunities to the public and installation personnel.

NSB Kings Bay would continue the recreation planning board that addresses means for providing recreational activities. Membership on the recreation board would consist of, at a minimum, the Natural Resources Manager, a member of the Facilities Review Board and the Director of MWR. NSB Kings Bay would also consider utilizing a NPS representative to review the findings of the analysis.

Objective 4.2: To continue to develop and maintain recreational facilities and trails and/or interpretive centers and signage to support the public and installation personnel.

Recreational facilities enhance the visitor experience and provide educational opportunities to expand the awareness of the unique ecosystems on NSB Kings Bay. NSB Kings Bay would maintain communication with MWR, update facilities and continue to look for opportunities to develop recreational trails, signage, and/or interpretive centers in areas of NSB Kings Bay with unique cultural, natural, historical, or archeological resources.

4.2 Species Management

The natural resources actions described in this INRMP are for the benefit of the plants, animals, and ecosystems occurring on this installation. Special attention is given to rare, threatened, and endangered (RTE) species, and their habitats, through management actions referenced in Table 4-1. These actions are long-term conservation measures that provide benefits for terrestrial and aquatic habitats on the installation. Management actions such as soil conservation and storm water management, for example, control sediment and pollutant runoff to protect nearshore water quality

for species such as manatees, shorebirds, and fish. Forestry actions such as prescribed burning, thinning, and reforestation help to establish longleaf pine stands and herbaceous low-lying vegetation that provide habitat and resources for gopher tortoises, as another example.

Table 4-1. Habitat Management Actions at NSB Kings Bay, Georgia.

Habitat Management Actions	Section
Wetland Management	4.3.1.1
Soil Conservation & Erosion Control	4.3.1.2
Stormwater & Water Quality Control	4.3.1.3
Landscaping, Grounds Maint., and Urban Forestry	4.3.1.4
Floodplain Management	4.3.1.5
Integrated Pest Management	4.3.1.6
Stand Improvement (i.e. prescribed burns and thinnings)	4.3.2.1
Land Treatment Area Forests	4.3.2.2
Reforestation	4.3.2.3
Forest Disease and Insect Protection	4.3.2.4
Habitat Enhancement (for fish and wildlife)	4.3.3.1
Threatened and Endangered Species Protection	4.3.3.2
Game Wildlife Management	4.3.3.3
Prevention & Control of Wildlife Damage and Disease	4.3.3.4
Freshwater Fisheries	4.3.3.5
Outdoor Recreation	4.3.4

The Fish and Wildlife Management section of this INRMP (see Section 4.3.3.2) includes additional goals, objectives, strategies, and projects for the benefit and long-term conservation of RTE species found, or potentially found, on the installation. RTE animal and plant species explicitly accounted for in this INRMP are:

- Atlantic Sturgeon (fish)
- Ball Moss (epiphyte)
- Bartram's Air Plant (epiphyte)
- Eastern Diamondback Rattlesnake
- Eastern Indigo Snake
- Fox Squirrel
- Giant Manta Ray
- Green-fly Orchid (epiphyte)
- Gopher Frog
- Gopher Tortoise
- Hooded Pitcher Plant
- Least Tern (bird)
- Monarch Butterfly
- North Atlantic Right Whale
- Painted Bunting (bird)
- Pond Spice (shrub)
- Red Knot (bird)
- Sea Turtles:
  - Green Sea Turtle
  - Hawksbill Sea Turtle
  - Kemp's Ridley Sea Turtle
  - Leatherback Sea Turtle
  - Loggerhead Sea Turtle

- Shortnose Sturgeon (fish)
- Smalltooth Sawfish
- Southern Hog-nosed Snake
- Spotted Turtle
- Striped Newt
- Tiny-leaf Buckthorn (shrub)
- West Indian Manatee
- Wood Stork

4.3 Natural Resources Management Strategies

This section discusses natural resources management at NSB Kings Bay by dividing natural resources into focus units: land management, forest management, fish and wildlife, and outdoor recreation. These focus units are further divided into subunits; for example, the land management discussion addresses wetlands, soil conservation and erosion control, stormwater, landscaping, IPM, and floodplains protection.

For each focus unit, Section 4.3 discusses the issue(s), long-term management of the issue(s), the relationship of the issue(s) to ecosystem management on NSB Kings Bay, the relationships among ecosystem management subunits, legal requirements, and sources for additional management information. This section also correlates the goals and objectives presented in Section 4.1 with the strategies and/or projects for each focus unit. Furthermore, the issues identified in Section 4.3 for each focus unit were used to develop the ecosystem management goals and objectives presented in Section 4.1. The relationship between projects and focus units are described in Section 4.3 and detailed information about each project to be implemented is presented in Section 6.

4.3.1 Land Management

This section addresses the development and implementation of programs and techniques for managing lands. The land management issues of this INRMP are wetlands, soil conservation and erosion control, stormwater, landscaping, IPM, and floodplains protection. NSB Kings Bay adheres to best management practices (BMPs) spelled out in the SWPPP (SUBASE 2014), the *Field Manual for Erosion and Sediment Control in Georgia* (GASWCC 2002) and *Georgia's Best Management Practices for Forestry* (GFC 2009) to minimize and control erosion, sedimentation, and stormwater.

According to DODDIR 4700.1, NSB Kings Bay is to promote agriculture outleasing on the installation. The NSB Kings Bay Natural Resources staff evaluated the potential for agricultural outleasing, but concluded that suitable lands are not available for this type of program. Future evaluations of agricultural outlease opportunities will be completed to determine haying or grazing potential consistent with the military mission on NSB Kings Bay lands.

4.3.1.1 Wetlands

Wetlands are generally considered to be transitional zones between the terrestrial and aquatic environment, and are characterized by physical, chemical, and biological features, which indicate hydrological conditions.

Issue

Wetlands at NSB Kings Bay include cypress domes, cypress/blackgum swamps, shrub swamps, low pine flatwoods, and salt marsh. These wetlands are associated with inland, riverine, and coastal environments. In general, wetlands at NSB Kings Bay (inland, riverine, and coastal) are in good condition, and have the required buffer for protection. Each wetland offers valuable wildlife habitat and water quality protection. However, because of numerous environmental constraints on NSB Kings Bay and the need for future mission requirements, NSB Kings Bay will be required to balance the protection of installation wetlands with the support of the military mission.

Goals, Objectives and Strategies

Table 4-2 identifies the ecosystem management goals, objectives and strategies relevant to wetland issue(s) and related long-term management.

Table 4-2. Natural Resources Management Goals, Objectives, and Strategies Related to Wetlands.

Goals	**Objectives**	**Strategies**
1	1.2	NSB Kings Bay would maintain an ecosystem management awareness and training/education program available to all interested NSB Kings Bay personnel.
1	1.2	NSB Kings Bay would participate in regional stewardship/research programs that foster citizen participation in ecosystem education and stewardship.
2	2.2	NSB Kings Bay would continue to implement and update when necessary, the long-term management plan to protect and conserve the natural functions of wetlands and shoreline areas, including limiting wetland shoreline destruction and reducing adverse impacts to water quality.
3	3.1	NSB Kings Bay would implement BMPs to provide water quality protection for wetlands.
3	3.2	NSB Kings Bay would implement programs and activities for the protection and enhancement of habitat for animal and plant species.
4	4.2	NSB Kings Bay would maintain communication with MWR and facilities to look for opportunities to develop recreational trails, signage, and/or interpretive centers in areas of NSB Kings Bay with unique cultural, natural, historical, or archeological resources.

Projects and Initiatives

Projects

Participation in the following projects will occur in support of the goals, objectives and strategies for wetlands:

- No. 1 (Invasive Plant Removal)
- No. 2 (Prescribed Burning to Support the Gopher Tortoise CCA)
- No. 3 (Pine Planting to Support the Gopher Tortoise CCA)
- No. 5 (Habitat Improvement Through Forest Management)
- No. 9 (Shoreline and Riparian Conservation)

Initiatives

1. For program development, enlist the services of foresters, wetland ecologists, fish and wildlife biologists, and soil conservationists from NAVFAC SE, as well as Federal, state, and county wildlife biologists, foresters, and land managers.
2. Encourage participation by providing information about installation wetland resources and communicating each individual's important contributions to ensuring a viable ecosystem. Use pamphlets, flyers, and command units to disseminate information.
3. Offer hands-on training and individual participation in activities to better demonstrate the concept, application, and importance of wetlands management. This includes participation in wetlands management activities such as landscaping (Section 4.3.1.4), reforestation (Section 4.3.2.3), and habitat enhancement (Section 4.3.3.1).
4. NSB Kings Bay will consider participation and/or coordination of a regional multi-agency effort to develop a geographic information system (GIS) database to identify wetland types, soils, geologic characteristics, landscape positions, and functional assessment field scores.
5. NSB Kings Bay would participate in research programs on coastal wetlands functions and values.
6. Continue to maintain environmental representation on the Facilities Review Board.
7. Continue to ensure that all wetlands (*e.g.*, inland, riverine and coastal) have a minimum of a 100-foot vegetative buffer, where a minimum amount of disturbance is allowed, to protect water quality. The following will be conducted to create and maintain the buffer and protect water quality of wetlands:
    - Periodically inventory wetlands size, composition and quality to identify areas with insufficient or inadequate buffering. List any areas with insufficient or inadequate buffering, identified by the survey, as projects in subsequent INRMP updates.
    - Encourage the use of volunteers to create buffers of native vegetation.
    - Use native species to increase wildlife use of these buffer areas.
8. The Environmental Department will monitor stormwater discharge into wetlands to address the protection of water quality. Ensure that:

- Stormwater runoff is subjected to BMPs prior to discharging into wetlands (SUBASE 2014). BMPs, in association with vegetated buffers, shall prevent or reduce the amount of pollution in water to a level compatible with Georgia Surface Water Quality Standards.
- No site activities on NSB Kings Bay result in violation of state water quality standards associated with the siltation of wetlands or reduction in the natural retention or filtering capability of wetlands.
- Adequate soil erosion measures are implemented.
- No site activities allow water to become a health hazard or to contribute to the breeding of mosquitoes.

9. Maintain natural shoreline buffers along undeveloped areas adjacent to Kings Bay and Cumberland Sound. A natural vegetated buffer will be maintained from the mean high water line to 100 feet landward. Allowances may be made for essential military mission requirements.
10. Ensure consistency with the Georgia Coastal Management Program, Georgia Shore Protection Act and the Georgia Coastal Marshlands Protection Act, as well as specific GDNR regulations for shoreline development and protection.
11. Monitor the quality and function of wetlands on NSB Kings Bay using the Uniform Mitigation Assessment Method (UMAM) developed by the South Florida Water Management District. Re-assess wetland acreage as necessary.
12. NSB Kings Bay will institute wetland education and stewardship programs.

Long-Term Management

NSB Kings Bay would continue to incorporate the DoN's policy of no net loss of wetlands, and to maintain and/or develop vegetative buffers with minimum widths of 100 feet around wetland areas, except when precluded by security regulations or where sufficient acreage is not available as determined by the NSB Kings Bay Natural Resources Manager. A minimum buffer width of 100 feet is required to provide the basic physical and chemical buffering necessary to reduce siltation, retain the natural attenuation and filtering capacity, and maintain the biological wetland communities. NSB Kings Bay would increase the width of existing vegetative buffers that are less than 100 feet wide to a minimum of 100 feet, providing that buffer acreage is available. NSB Kings Bay would not remove any portion of the buffer or vegetation that would result in a buffer width of less than 100 feet. NSB Kings Bay adheres to BMPs spelled out in the SWPPP (SUBASE 2014), the *Field Manual for Erosion and Sediment Control in Georgia* (GASWCC 2002) and *Georgia's Best Management Practices for Forestry* (GFC 2009) to minimize and control erosion, sedimentation, and stormwater runoff that may affect wetlands quality.

In areas where the acreage available for buffering is not sufficient, or where greater protection is needed, other protective measures would be employed. These protective measures include: 1) redirecting, discouraging, or prohibiting pedestrian and pet access to the wetland or buffer

area by the placement of hedges, fences, or signs; and 2) planting vegetated filter strips (swaths of land planted with grasses and trees) to intercept uniform sheet flows of runoff before the runoff reaches a wetland. NSB Kings Bay would use these methods individually or in combination along wetland perimeters.

Although the wetlands at NSB Kings Bay are considered in good overall condition, other potential long-term management concepts for wetlands include the creation and expansion of wetlands, water quality monitoring, and more extensive inventory of existing wetlands. Creation and expansion of wetlands would occur only if land and funding are available. NSB Kings Bay would continue water quality monitoring measures within the NSB Kings Bay wetlands using members of the stormwater pollution prevention team. Anticipated growth and development within the NSB Kings Bay region may require a coordinated, regional multi-agency effort, which involves state officials and technical advisors from local government and academia, to develop a GIS database to identify wetland types, soils, geologic characteristics, landscape positions, and functional assessment field scores. The completion of this project will enhance regional planning activities, protect the value and function of vital wetland resources, and provide education and stewardship opportunities to citizens, school groups, and other conservation agencies.

Environmental Stewardship/Education Measures

Environmental education and stewardship are vital components of an effective ecosystem management program. These would be achieved by offering hands-on training in buffer and wetland enhancement projects, as well as by facilitating individual and group participation through formal coordination with volunteer groups, including local Scout troops and interested installation personnel. In addition, NSB Kings Bay would continue to cooperate with universities and other research institutions in conducting research on wetland qualities and functions.

The Georgia school system published a Georgia Wetland Education Curriculum Guide, *Georgia's Wetland Treasures*. This guidebook contains fact sheets about wetland ecology and plants and animals, field and classroom student activities, plant and animal identification guides, a wetland vocabulary glossary, and interdisciplinary ideas and activities. Because of the wide variety and good conditions of the NSB Kings Bay wetlands, NSB Kings Bay would cooperate in providing field trips to students participating in the Georgia school system wetland education program.

Several long-term salt marsh productivity research projects funded by the National Science Foundation and have been conducted along coastal Georgia. NSB Kings Bay would cooperate with future studies, and would evaluate the results of the studies for implementation on the NSB Kings Bay property provided that implementation of the study recommendations does not conflict with the military mission.

Environmental Considerations During Management Practices

Short-term impacts to wetland vegetation, wildlife, soil erosion and water quality potentially could occur during the expansion and enhancement of wetland areas.

Applicability of Other Management Issues and NSB Kings Bay Programs

The following management issues, programs, and actions are directly or indirectly related to the management of wetland areas and will be consulted for additional management information, or provided as additional training and education:

- Stormwater runoff, Section 4.3.1.2 – wetlands for stormwater runoff;
- Timber stand improvement, Section 4.3.2.1 – prescribed burns within wetlands;
- Forestry Management, Section 4.3.2 – commercial harvesting using best management practices (BMPs) to protect wetlands;
- Outdoor Recreation, Section 4.3.4 – restricted uses within wetlands;
- Fish and Wildlife, Section 4.3.3 – use of wetlands for fish and wildlife habitat;
- Fish and Wildlife, Section 4.3.3 – endangered species habitat;
- The wetland buffer concept will be integrated into the NSB Kings Bay grounds maintenance program;
- Much of the land along the North River and Mariana Creek will serve as a natural vegetated buffer for Kings Bay and Cumberland Sound.

Ecosystem Management

Wetlands management is an essential component of ecosystem management because healthy, protected wetlands provide habitats for migratory birds, fish, and other animals; store and purify water; and provide open space and aesthetic value.

Climate Change

According to the EPA, ocean levels in Georgia are expected to rise one-to-four feet in the next century. This would create a state of chronic saltwater intrusion into coastal wetlands, triggering a cascade of ecological change, most easily identified by the browning and death of surrounding trees. Wetlands naturally increase their elevation by converting sediment and decomposing marsh plants into soil, but this adaptation may be outpaced by the current rate of sea level rise, especially if exacerbated by tropical storm flood events. Management actions that may buffer wetlands against saltwater intrusion include the enhancement of oyster reefs in adjacent salt marsh to mitigate the impact of tropical storm wave action, the removal of aggressive salt-tolerant invasive plants such as common reed (*Phragmites australis*), and the maintenance of natural conservation corridors to allow salt-intolerant animals, such as amphibians, to access wetlands at higher elevations.

Laws, Executive Orders, Regulations, Directives, and Memoranda Relevant to Wetland Areas

Federal Water Pollution Control Act, as amended by the Clean Water Act (CWA) of 1977, 33 United States Code (USC) 1251, prohibits the discharge of dredged or filled materials into waters of the United States, including wetlands, without first obtaining a permit from the USACE (Section 404 of the CWA).

Executive Order (EO) 11990, 24 May 1977, as amended, requires government agencies, in carrying out agency actions and programs affecting land use, to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands.

Clean Water Act: Section 401 Water Quality Certification, 1986, 33 USC 1341, requires that states certify compliance with Federal permits or licenses and with state water quality requirements and other applicable state laws. Under Section 401, states have the authority to review any Federal permit or license that may result in a discharge to wetlands or other waters under the state's jurisdiction to ensure that the actions would be consistent with the state's water quality requirements.

EO 13112, 3 February 1999, requires executive agencies to restrict the introduction of exotic organisms into natural ecosystems.

OPNAV M-5090.1D, 12-3.8(b), discusses natural resources management relating to wetland management.

Georgia Coastal Marshlands Protection Act recognizes the state marshlands as vital natural resources. It also provides protection to tidal wetlands; requires permits for structures (*e.g.*, marinas, community docks, boat ramps, recreational docks, and piers) and dredging and filling; and establishes the Coastal Marshlands Protection Committee.

Additional Sources of Information

Technical Reports/Publications:

Wetland Creation and Restoration: The Status of the Science by Jon A. Kusler and Mary E. Kentula.

Clean Water Action Plan: Restoring and Protecting America's Waters, United States Environmental Protection Agency and the United States Department of Agriculture, October 1998.

Georgia's Wetland Treasures, Georgia Department of Natural Resources Coastal Resources Division and United States Environmental Protection Agency, by Margaret Olsen, Woodward Academy, College Park, Georgia.

Telephone Contacts:

USFWS, Regional Wetland Coordinator: (404) 679-7129

The Center for Wetlands (University of Florida): (352) 392-2424

The Wildlife Society: (301) 897-9770

Georgia Department of Natural Resources, Coastal Division: (912) 264-7218

Internet Addresses:

Forested wetlands:

http://www.sfrc.ufl.edu/extension/florida_forestry_information/planning_and_assistance/wetlands_regulations.html

Bottomland forest communities:

http://www.sfrc.ufl.edu/Extension/florida_forestry_information/forest_resources/bottomland.html

Wetland Restoration, Enhancement, and Management:

https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_010838.pdf

University of Florida, Center for Aquatic and Invasive Plants:

https://plants.ifas.ufl.edu/

Society of Wetland Scientists

www.sws.org

Society for Ecological Restoration

www.ser.org

4.3.1.2 Soil Conservation and Erosion Control

Soil conservation involves the identification (*e.g.*, type, location and amount) and appropriate use of soils in accordance with the limits of its physical characteristics while protecting it from uncontrolled stormwater runoff to prevent and control soil erosion. This information will be used to plan the use and management of soils for construction, forestry practices, recreation facilities, and wildlife habitat. More fragile soil types require modifications to the timing, intensity and frequency of forestry and wildlife management practices. Knowing where soil types are located on a particular tract, and understanding the capabilities and limitations of the soils are prerequisites to selecting the most appropriate wildlife habitat or forestry improvement practices.

Issue

Much of the area on NSB Kings Bay has very poorly to poorly drained soils, which are susceptible to a high rate of runoff and significant soil erosion. Soil erosion contributes to diminished water quality and conveyance problems, which may include: 1) elimination of habitat (terrestrial and aquatic); 2) reduction in reservoir capacity and stream flow; 3) increased flooding potential;

4) turbid water; and 5) increased maintenance time and costs associated with stormwater facilities (*e.g.*, culverts, ditches, and swales).

Water quality is affected by increased sedimentation. Sedimentation is particularly detrimental to benthic organisms and fish species. Sedimentation can eliminate habitat by covering food sources and spawning sites and can smother bottom-dwelling organisms and periphyton. In addition, sedimentation increases turbidity, thereby negatively impacting aquatic vegetation photosynthesis by limiting the depth to which light can penetrate. Reductions in photosynthesis can decrease dissolved oxygen levels below minimum thresholds required to sustain aquatic vegetation, fish, and benthic invertebrates.

Actions contributing to soil erosion on NSB Kings Bay include:

- Pedestrian traffic on grassy areas of low sustainability due to poor soil conditions. This has resulted in a turf of thin grass interspersed with bare sandy areas.
- Human alterations to the natural vegetative cover and topography, including the channeling of water flow (*e.g.*, ditches) which increases the quantity and rate of flow; the exposure of soils and increased soil slopes; and/or the creation of impervious surfaces.
- Forestry practices, including prescribed burns, thinning, and reforestation, exposing soils to rainfall and stormwater runoff.
- Wave and wake action along the shoreline area of NSB Kings Bay.
- Development on sites with poor soil quality.
- Improper mowing and maintenance of grassed areas.

Goals, Objectives and Strategies

Table 4-3 shows the ecosystem management goals, objectives, and strategies (Section 4.1) relevant to soil erosion and conservation issue(s), and long-term management.

Table 4-3. Natural Resources Management Goals, Objectives, and Strategies Related to Soil Erosion and Conservation.

Goals	Objectives	Strategies
1	1.2	NSB Kings Bay would maintain an ecosystem management awareness and training/education program available to all interested NSB Kings Bay personnel.
2	2.2	NSB Kings Bay would continue to implement and update when necessary, the long-term management plan to protect and conserve the natural functions of wetlands and shoreline areas, including limiting wetland shoreline destruction and reducing adverse impacts to water quality.
2	2.2	NSB Kings Bay would periodically evaluate its stormwater management program and activities contributing to stormwater runoff and/or pollutant loading in stormwater runoff.
2	2.2	NSB Kings Bay would evaluate its soil erosion control management program annually and would reduce the rate of soil erosion through the implementation and maintenance of long-term measures and projects.

Table 4-3, continued.

3	3.1	NSB Kings Bay would implement BMPs (GASWCC 2002; GFC 2009; SUBASE 2014) to provide water quality protection for wetlands.
3	3.2	NSB Kings Bay would evaluate opportunities for habitat protection and enhancement.
3	3.4	NSB Kings Bay would implement appropriate measures to protect water quality of installation fishery resources.

Projects and Initiatives

Projects

Participation in the following projects would occur in support of the goals, objectives and strategies for soil conservation and erosion control:

- No. 1 (Invasive Plant Removal)
- No. 2 (Prescribed Burning to Support the Gopher Tortoise CCA)
- No. 3 (Pine Planting to Support the Gopher Tortoise CCA)
- No. 5 (Habitat Improvement Through Forest Management)
- No. 9 (Shoreline and Riparian Conservation)

Initiatives

1. For program development, enlist the services of foresters, fish and wildlife biologists, and soil conservationists from NAVFAC SE, as well as Federal, state, and county wildlife biologists, foresters, and land managers.
2. Offer hands-on training and individual participation in activities to better demonstrate the concept, application, and importance of soil erosion control. Integrate other resource management activities such as landscaping (Section 4.3.1.4), wetland enhancement (Section 4.3.1.1), reforestation (Section 4.3.2.3), and outdoor recreation (4.3.4).
3. Continue to maintain environmental representation on the Facilities Review Board.
4. The Environmental Department would monitor stormwater discharge to address the protection of water quality. Ensure that:
    - NSB Kings Bay adheres to BMPs spelled out in the *Field Manual for Erosion and Sediment Control in Georgia* (GASWCC 2002) and *Georgia's Best Management Practices for Forestry* (GFC 2009) to control erosion and sedimentation. BMPs shall prevent or reduce the amount of pollution in water to a level compatible with Georgia Surface Water Quality Standards.
    - No site activities on NSB Kings Bay result in violation of state water quality standards associated with the siltation of wetlands or reduction in the natural retention or filtering capability of wetlands. See Section 4.3.1.1 for further information on the use of buffers to minimize the siltation of wetlands from nonpoint sources.
    - Adequate soil erosion measures are implemented.

5. Ensure consistency with the Georgia Coastal Management Program, Georgia Shore Protection Act and the Georgia Coastal Marshlands Protection Act, as well as specific GDNR regulations for shoreline development and protection.
6. NSB Kings Bay would continue to manage point and nonpoint source stormwater in industrial areas consistent with BMPs described in the SWPPP (SUBASE 2014), and will update its SWPPP to include stormwater management practices for non-industrial areas. The SWPPP will ultimately address the maintenance of stormwater structural control; stormwater treatment projects; roadway maintenance activities; flood and soil control projects; pesticide, herbicide and fertilizer application; external connections and discharges; and construction activities.
    - Action shall be undertaken by the Environmental Director in concert with the Water program Manager and Natural Resources Manager. Action will include consultation with Environmental Engineers and professionals from NAVFAC SE.
7. NSB Kings Bay will manage stormwater runoff from new development to achieve no net increase in stormwater discharge from the installation, unless it is impossible to do so and satisfy the military mission.
    - Action shall be implemented as part of the Facilities Review Board process in consultation with the Environmental Director and Water Program Manager.
8. Map soils units and areas where soil type presents a threat of erosion.
9. Train and educate all contract and department personnel on actions that may directly or indirectly contribute to soil erosion problems and measures that can be employed to avoid or lessen these conditions.
10. Consult with soil conservation experts from NAVFAC SE, Georgia Soil and Water Conservation Commission (GASWCC) as well as with the USDA NRCS on the training program development.
11. Continue to operate the existing soil conservation and erosion control program through BMPs described in the SWPPP (SUBASE 2014). Implement the long-term management concepts in Section 4.3.1.3, including, updating the SWPPP to include control measures for forest and shoreline areas and for forestry, reforestation, and timber stand improvements.
    - Action shall be undertaken by the Environmental Director in concert with the Water Program Manager and Natural Resources Manager. Action will include consultation with soil conservation experts at NAVFAC SE, USDA NRCS and the GASWCC.
12. Comply with the Georgia Erosion and Sedimentation Control Act (ESCA) by consulting directly with the NRCS through the use of an Interagency Agreement (IAG). This agreement allows NRCS supervision and inspection of any soil disturbing activities at NSB Kings Bay to satisfy Georgia ESCA requirements.

Long-Term Management

The long-term management concept for soil conservation is to identify and understand the suitability and sustainability of a soil unit for a proposed action. USDA NRCS soil surveys have been reviewed to determine constraints on soil management units, and may also be used to determine appropriate management practices. The USDA NRCS soil survey for Camden County, Georgia

(1980) also provides information about potential erosion hazards; groundwater contamination; productivity of cultivated crops, trees, and grass; and the protection of water quality, wetlands, and wildlife habitat.

NSB Kings Bay would continue to operate its soil conservation and erosion control program using the BMPs described in the SWPPP (SUBASE 2014), the *Field Manual for Erosion and Sediment Control in Georgia* (GASWCC 2002), and *Georgia's Best Management Practices for Forestry* (GFC 2009), as well as the six principles for soil conservation and erosion management presented in Smoot and Smith (1999):

1. minimizing areas of disturbance by leaving intact stream buffers, forest conservation areas, wetlands, highly erodible soils, steep slopes, environmental features, and stormwater filtration areas;
2. stabilizing and protecting disturbed areas from rainfall and runoff energies as soon as practicable;
3. minimizing runoff velocities;
4. protecting waterways and stabilizing drainage ways that may be particularly susceptible to sedimentation;
5. retaining sediment within construction sites; and
6. reducing exposure time.

NSB Kings Bay would continue to update its SWPPP as necessary, to include control measures for forest and shoreline areas and forestry actions and implement state BMPs during forest management operations.

NSB Kings Bay would evaluate and map erosion control problem areas on the installation, provide training to all land managers on fundamental soil control measures and advanced soil erosion design measures, and comply with the Georgia ESCA by consulting directly with the NRCS through the use of an IAG. This agreement allows NRCS supervision and inspection of any soil disturbing activities at NSB Kings Bay to satisfy Georgia ESCA requirements.

Measures to control potential erosion problems include:

- vegetative and structural protective cover (*e.g.*, permanent seeding, groundcover);
- sediment barriers (*e.g.*, straw bales, silt fence, brush);
- sediment detention ponds and basins (*e.g.*, sediment traps and basins);
- stream and shore bank protection (*e.g.*, riprap);
- constructing pervious surface walkways in areas of high pedestrian traffic; and
- water conveyances (*e.g.*, slope drains, check dam inlet and outlet protection).

Environmental Education/Stewardship

NSB Kings Bay would cooperate with the University of Georgia during the College of Agricultural and Environmental Studies Soil and Water Stewardship Week each spring. In addition, NSB Kings Bay would educate all managers and contractors about activities that can contribute to soil erosion and preventative measures (*e.g.*, grounds maintenance crews).

Environmental Considerations During Management Practices

None.

Applicability of Other Management Issues and NSB Kings Bay Programs

The following issues, programs, and actions are directly or indirectly related to the management of soil erosion and conservation, and will be consulted for additional information or provided as supplemental training and education:

- Stormwater runoff, Section 4.3.1.3 – stormwater and sedimentation.
- Forestry, Section 4.3.2 – erosion control during forest management practices.
- Wetlands, Section 4.3.1.1 – sedimentation of wetlands.
- BMPs of the SWPPP (SUBASE 2014).
- Soil conservation and erosion control for non-industrial areas and actions will be integrated into NSB Kings Bay's SWPPP.
- Grounds Maintenance and Landscaping, Section 4.3.1.4 – utilizing cover to minimize erosion areas.

Ecosystem Management

Soil conservation is an essential component of the ecosystem management concept. Soils are particularly susceptible to erosion from uncontrolled stormwater runoff, and may discharge into water bodies from point and nonpoint sources. Sediments in stormwater runoff have the capacity to obstruct drainage infrastructure and to reduce the volume capacity of wetlands, potentially resulting in damaging flood conditions. Turbidity derived from soil erosion also may affect fishery resources and other associated aquatic communities on the installation, in Kings Bay and Cumberland Sound, and in adjacent wetlands.

Climate Change

The rate and severity of soil erosion is affected by precipitation, temperature, runoff, and vegetative cover, all of which are susceptible to climate change. Increased and prolonged drought can result in the loss of vegetation that would otherwise stabilize embankments. Increased precipitation may exacerbate, these conditions by removing topsoil through runoff and thereby inhibiting vegetative re-establishment. In addition, tropical storm events can bring coastal flooding that dramatically erode dune systems and landscapes. Often, small-scale instances of soil erosion due to even minor changes in vegetation cover or surface runoff can persist and grow, so awareness combined with rapid recognition and response are all important to mitigate the impacts of soil degradation.

Laws, Executive Orders, Regulations, Directives, and Memoranda Relevant to Soil Conservation

Soil Conservation Act, 16 USC 590a et seq., provides for soil conservation practices on Federal lands.

Federal Water Pollution Control Act, as amended by the CWA of 1977, 33 USC 1251, regulates the dredging and filling of wetlands and establishes procedures for identifying and regulating nonpoint sources of polluted discharge, including turbidity, into waterways.

EOs 11989 and 12608 close areas to off-road vehicles where soil, wildlife, or other natural resources may be adversely affected.

EO 13112, 3 February 1999, requires executive agencies to restrict the introduction of exotic organisms into natural ecosystems. Vegetative buffers and landscaping to control soil erosion must comply with this executive order.

OPNAV M-5090.1D, 12-3.8(d) discusses natural resources management relating to soil conservation management.

Georgia Erosion and Sedimentation Control Act requires the implementation of comprehensive ordinances for all land disturbance activities including BMPs.

Additional Sources of Information

Telephone Contacts:

USDA NRCS: (912) 265-8092

Camden County Extension Office: (912) 576-3219

Internet Addresses:

Georgia Soil and Water Conservation Commission (GASWCC):
http://gaswcc.georgia.gov

University of Tennessee, Knoxville, Water Resources Research Center:
http://isse.utk.edu/wrrc/

NRCS Soil Erosion and Land Use Information:
https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/landuse/crops/erosion/

4.3.1.3 Stormwater and Water Quality Control

Stormwater runoff is precipitation that falls onto surfaces, such as roofs, streets, the ground, etc., and is not absorbed or retained by that surface, but flows off, collecting volume and energy. Stormwater runoff management addresses measures to reduce flow energy and pollutants in stormwater, and to control discharge from point and nonpoint sources. Nonpoint source pollution is pollution of surface-water and groundwater by diffuse sources. Point source pollution is pollution identified by a single, identifiable point source.

Issue

As development and land clearing activities continue, more surface area is covered or paved, thus becoming unavailable for absorption and filtration. This results in increased runoff rates and pollution loads to installation and surrounding water bodies.

Goals, Objectives and Strategies

Table 4-4 shows the ecosystem management goals, objectives, and strategies (Section 4.1) that are relevant to stormwater and water quality issue(s) and long-term management.

Table 4-4. Natural Resources Management Goals, Objectives, and Strategies Related to Stormwater and Water Quality.

Goals	Objectives	Strategies
1	1.2	NSB Kings Bay would maintain an ecosystem management awareness and training/education program available to all interested NSB Kings Bay personnel.
2	2.2	NSB Kings Bay would continue to implement and update when necessary, the long-term management plan to protect and conserve the natural functions of wetlands and shoreline areas, including limiting wetland shoreline destruction and reducing adverse impacts to water quality.
2	2.2	NSB Kings Bay would periodically evaluate its stormwater management program and activities contributing to stormwater runoff and/or pollutant loading in stormwater runoff.
2	2.2	NSB Kings Bay would evaluate its soil erosion control management program annually and would reduce the rate of soil erosion through the implementation and maintenance of long-term measures and projects.
3	3.1	NSB Kings Bay would implement BMPs (GASWCC 2002; GFC 2009; SUBASE 2014) to provide water quality protection for wetlands.
3	3.2	NSB Kings Bay would evaluate opportunities for habitat protection and enhancement.
3	3.4	NSB Kings Bay would implement appropriate measures to protect water quality of installation fishery resources.

Projects and Initiatives

Projects

Participation in the following projects would occur in support of the goals, objectives and strategies for stormwater and water quality:

- No. 1 (Invasive Plant Removal)
- No. 2 (Prescribed Burning to Support the Gopher Tortoise CCA)
- No. 3 (Pine Planting to Support the Gopher Tortoise CCA)
- No. 5 (Habitat Improvement Through Forest Management)
- No. 9 (Shoreline and Riparian Conservation)

Initiatives

1. For program development, enlist the services of foresters, fish and wildlife biologists, water resources specialists, and soil conservationists from NAVFAC SE, as well as Federal, state, and county wildlife biologists, foresters, and land managers.
2. Encourage participation by providing information about installation stormwater management and communicating each individual's important contributions to maintaining water quality. Use pamphlets, flyers, and command units to disseminate information.
3. Offer hands-on training and individual participation in activities to better demonstrate the concept, application, and importance of stormwater management. These include other activities such as landscaping (Section 4.3.1.4), wetland enhancement (Section 4.3.1.1), reforestation (Section 4.3.2.3), urban forestry (Section 4.3.2.3), and habitat improvements (Section 4.3.3.1).
4. Continue to maintain environmental representation on the Facilities Review Board.
5. The Environmental Department would monitor stormwater discharge into water bodies to address the protection of water quality. Ensure that:
    - NSB Kings Bay adheres to the BMPs spelled out in the SWPPP (SUBASE 2014), the *Field Manual for Erosion and Sediment Control in Georgia* (GASWCC 2002), and *Georgia's Best Management Practices for Forestry* (GFC 2009) to control erosion and sedimentation. BMPs shall prevent or reduce the amount of pollution in water to a level compatible with Georgia Surface Water Quality Standards.
    - No site activities on NSB Kings Bay result in violation of state water quality standards associated with the siltation of wetlands or reduction in the natural retention or filtering capability of wetlands. Buffers around wetlands would be used to minimize the siltation of wetlands from nonpoint sources.
    - Adequate soil erosion measures are implemented.
6. Maintain natural vegetated shoreline buffers along undeveloped areas adjacent to Kings Bay and Cumberland Sound to slow stormwater discharge and improve water quality.
7. Ensure consistency with the Georgia Coastal Management Program, Georgia Shore Protection Act and the Georgia Coastal Marshlands Protection Act, as well as specific GDNR regulations for stormwater discharge and water quality protection.
8. NSB Kings Bay would continue to manage point and nonpoint source stormwater in industrial areas consistent with BMPs described in the SWPPP (SUBASE 2014), and will update its SWPPP to include stormwater management practices for non-industrial areas. The SWPPP would ultimately address the maintenance of stormwater structural control; stormwater treatment projects; roadway maintenance activities; flood and soil control projects; pesticide, herbicide and fertilizer application; external connections and discharges; and construction activities.
    - Action shall be undertaken by the Environmental Director in concert with the Water Program Manager and Natural Resources Manager. Action will include consultation with Environmental Engineers and professionals from NAVFAC SE.

4. NSB Kings Bay would, as part of their Oil and Hazardous Substance Spill Contingency Plan, establish a natural resources damage assessment program for assessing natural resources

damage or potential damage arising from the release of oil or hazardous substances that degrade or threaten to degrade natural resources of the U.S.

- Action shall be undertaken by the Environmental Director in concert with the Natural Resources Manager. Action will include consultation with Environmental Engineers from NAVFAC SE.

10. NSB Kings Bay would manage stormwater runoff from new development to achieve no net increase in stormwater discharge from the installation, unless it is impossible to do so and satisfy the military mission.
    - Action shall be implemented as part of the Facilities Review Board process in consultation with the Environmental Director and Water Program Manager.
11. Map soils units and areas where soil type presents a threat of erosion.
12. Train and educate all contract and department personnel on actions that may directly or indirectly contribute to soil erosion problems and measures that can be employed to avoid or lessen these conditions.
13. Consult with soil conservation experts from NAVFAC SE, Georgia Soil and Water Conservation Commission (GASWCC) as well as with the USDA NRCS on the training program development.
14. Continue to operate the existing soil conservation and erosion control program through BMPs described in the (SWPPP SUBASE 2014). Implement the long-term management concepts in Section 4.3.1.3, including, updating the SWPPP to include control measures for forest and shoreline areas and forestry actions.
    - Action shall be undertaken by the Environmental Director in concert with the Water Program Manager and Natural Resources Manager. Action will include consultation with soil conservation experts in NAVFAC SE, USDA NRCS and the GASWCC.
15. Comply with the Georgia Erosion and Sedimentation Control Act (ESCA) by consulting directly with the NRCS through the use of an Interagency Agreement (IAG). This agreement allows NRCS supervision and inspection of any soil disturbing activities at NSB Kings Bay to satisfy Georgia ESCA requirements.

Long-Term Management

NSB Kings Bay adheres to the BMPs spelled out in the SWPPP (SUBASE 2014), the *Field Manual for Erosion and Sediment Control in Georgia* (GASWCC 2002), and *Georgia's Best Management Practices for Forestry* (GFC 2009) to control erosion, sedimentation, and stormwater. NSB Kings Bay would also be guided by six management concepts for stormwater runoff and water quality control:

1. NSB Kings Bay would continue to manage point and nonpoint stormwater in industrial areas consistent with BMPs described in the SWPPP (SUBASE 2014), the *Field Manual for Erosion and Sediment Control in Georgia* (GASWCC 2002), and *Georgia's Best Management Practices for Forestry* (GFC 2009), to the extent practicable.
2. NSB Kings Bay would update its SWPPP to include stormwater management practices for non-industrial areas such as golf courses, urban land uses, and forested and shoreline

areas, and for non-industrial activities such as golf course pesticide application, land application activities, and forestry activities.

3. NSB Kings Bay would establish a shoreline buffer area adjacent to Kings Bay and Cumberland Sound. A natural vegetated buffer will be maintained from the mean high water line 50 feet landward. Allowances will be made for essential military mission requirements.

4. NSB Kings Bay would, as part of their Oil and Hazardous Substance Spill Contingency Plan, establish a natural resource damage assessment program for assessing natural resource damages arising from the release of oil or hazardous substances that degrade or threaten to degrade natural resources of the United States. The program will apply to releases from both DoD and non-DoD sources. The program will consist of criteria and procedures for collecting and evaluating the extent of damage to natural resources resulting from an incident and for determining restoration measures.

5. NSB Kings Bay would manage stormwater runoff from new development to achieve no net increase in stormwater discharge from the installation, unless doing so would conflict with the military mission. To accomplish no net increase in stormwater discharge, NSB Kings Bay would:

   - coordinate with the Grounds Maintenance personnel to ensure appropriate cleaning and maintenance of stormwater drainage mechanisms (*e.g.*, ditches, canals, culverts, and swales).
   - retrofit stormwater infrastructure to provide natural infiltration (*e.g.*, grass swales, shallow retention ponds adjacent to intakes) of stormwater or to increase detention time prior to discharge.
   - use natural or planted buffers around newly created stormwater ponds. Vegetation will provide wildlife habitat and will reduce impacts associated with runoff by filtering sediments and sediment-bound pollutants, and by facilitating infiltration prior to discharge into surface water. Reducing sediment loading will increase the longevity of the retention ponds and will reduce future maintenance costs.
   - use permeable alternatives to impervious surfaces; for example, wood decks instead of concrete patios, grass swales instead of concrete.

6. NSB Kings Bay would assess alternatives to existing pesticides, herbicides, and fertilizers with the intent of protecting water quality. NSB Kings Bay intends to use a combination of organic and mineral fertilizers to minimize the potential for nutrient loading in stormwater runoff while ensuring the growth of landscaping on NSB Kings Bay. NSB Kings Bay intends to use pesticides with lower toxicity levels and to apply them at reduced rates.

   - Organic matter or green waste will be the nutrient material of choice for landscaping. Organic matter consists of the wastes and remains of plants.
   - Mineral fertilizers are materials, either natural or manufactured, containing nutrients essential for the normal growth and development of the plants. Mineral fertilizers include both fast and slow-release fertilizers, and will be used to supplement organic matter for the growth and development of landscaping.
   - Slow-release fertilizers will be the mineral fertilizer of choice, and will be used in combination with organic matter when it is impractical to use only organic matter. Slow-release mineral fertilizers are released at slow rates throughout the season, thereby reducing the amount of waste by leaching, and reducing the potential for

surface water contamination. Other benefits of using slow-release fertilizers are reduced application frequency and minimization of fertilizer burn.

- A blended fast and slow-release mineral fertilizer will be used in areas where the following conditions are met: 1) areas of size where the use of organic material is impractical; and 2) areas where there is no potential for the discharge of fertilizer into surface water bodies.
- The use of pesticides with lower toxicity levels applied at reduced rates will be evaluated.
- Fertilizers or pesticides will not be applied before or during rain events due to the strong likelihood of runoff. Fertilizers and pesticides will be applied during maximum plant uptake periods to minimize leaching.
- The Applied Biology Department of NAVFAC SE will be contacted for information regarding fertilizer and pesticide applications.

Climate Change

Water resources in the United States are affected by a number of climate stressors, including increasing temperatures, changing precipitation patterns, and extreme events. Elevated water temperatures and increased sediment runoff are two of the most obvious impacts to water quality that result from climate change. Measures that can help to maintain good water quality and stormwater management in the face of a warming climate include:

- Planting trees to shade the ground and keep it cool, and reduce erosion;
- Controlling stream bank erosion to keep channels from getting wider and shallower, which would warm them more easily, and to reduce heat-trapping particles in water;
- Creating deep pools and artificial logjams to provide shade or deep water that limits direct heating from sunlight and creates biotic refugia and habitat;
- Removing unneeded channelization to restore natural groundwater exchange and connection to floodplains which promotes floodwater infiltration into aquifers;
- Constructing narrow streets for less heat-holding asphalt and to yield less runoff;
- Permeable paving to keep runoff from moving over heated roadways and promote infiltration during rain events;
- Building swales and rain gardens to get water underground and control runoff;
- Using rain barrels and cisterns to keep stormwater on a lot; and
- Installing green roofs to lower temperatures compared to conventional roofs, reduce energy use and waste heat, and trap stormwater on site.

Environmental Education/Stewardship

NSB Kings Bay would provide training and education to all land managers, as well as department personnel.

Environmental Considerations During Management Practices

There is the potential for loss of open space, forested areas, and/or wildlife habitat from the construction of stormwater facilities (*e.g.*, ditches, swales, or retention/detention ponds).

Applicability of Other Management Issues and NSB Kings Bay Programs

The following management issues, programs, and actions are directly or indirectly related to the management of stormwater/water quality, and will be consulted for additional management information or provided as additional training and education:

- Soil conservation and erosion, Section 4.3.1.2 – sedimentation as a primary pollutant load in stormwater runoff, and selection of the appropriate soil types for placement of drainage control structures.
- Wetlands, Section 4.3.1.1 – the use of wetlands for stormwater management and buffers for water quality protection.
- Landscaping, Section 4.3.1.4 – increased use of native plant species to reduce the need for pesticides and fertilizers, and increased use of green waste.
- Forestry Management, Section 4.3.2 – use appropriate BMPs during commercial harvesting and timber stand improvement activities to minimize stormwater runoff.
- Habitat Enhancement, Section 4.3.3.1 – encourage the use of stormwater retention/detention ponds as habitat for fish and wildlife.
- Land Application, Section 4.3.2.2 – renovation of industrial and domestic wastewater.
- Freshwater Fisheries, Section 4.3.3.5 – water quality protection.

Ecosystem Management

Similar to soil conservation, effective management of stormwater and associated pollutant loading is essential to realizing the ecosystem management concept. Implementation of BMPs in developed, semi-developed, and unimproved areas will help protect water quality and habitat for aquatic life. BMPs address the reduction of sedimentation, nutrient loading, bacterial and parasitic pests, and harmful chemicals in stormwater. Construction of any new stormwater ponds in accordance with the stormwater and water quality management concept will increase wildlife habitat and reduce the potential for additional discharge from new development into Kings Bay and Cumberland Sound.

Laws, Executive Orders, Regulations, Directives, and Memoranda Relevant to Stormwater

Federal Water Pollution Control Act, as amended by the CWA of 1977, 33 USC 1251, describes guidelines for the control of nonpoint source pollution.

Coastal Zone Management Act of 1972 (CZMA), 16 USC 1451 et seq., establishes authority (Section 6217) for states to administer coastal nonpoint pollution programs when approved by the National Oceanic and Atmospheric Administration (NOAA) and EPA. NSB Kings Bay will

coordinate with the state of Georgia for nonpoint source compliance with the Georgia Coastal Nonpoint Source Pollution Control Program.

EO 11990, 24 May 1977, as amended, directs the preservation and enhancement of wetlands.

Oil Pollution Act of 1990 (OPA 90), 33 USC 2701, requires planning for, rescue of, minimization of injury to, and assessment of damages or injury to fish and wildlife resources from the discharge of oil.

Comprehensive, Environmental Response, Compensation and Liability Act, 42 USC 9601, et seq., authorizes Natural Resource Trustees to recover damages for injury to, destruction of, or loss of natural resources resulting from the release of a hazardous substance.

OPNAV M-5090.1D, 12-3.8(f), discusses natural resources management relating to nonpoint source pollution.

OPNAV M-5090.1D, Chapter 26, establishes requirements, guidelines, and standards for the assessment of damages arising from the release of oil or hazardous substances.

Georgia Erosion and Sedimentation Control Act of 1975 requires the implementation of comprehensive ordinances for all land disturbance activities including BMPs.

Additional Sources of Information

Telephone Contacts:

U.S. Environmental Protection Agency

Nonpoint Source: (404) 562-9394

Internet Addresses:

Georgia Department of Natural Resources, Watershed Protection Branch:

https://epd.georgia.gov/watershed-protection-branch

Nonpoint Source Pollution of Surface Waters:

https://www.epa.gov/nps/what-nonpoint-source

National Pollutant Discharge Elimination System (NPDES)Stormwater Program:

https://www.epa.gov/npdes/npdes-stormwater-program

Controlling Nonpoint Source Pollution:

https://www.epa.gov/nps/nonpoint-source-what-you-can-do

4.3.1.4 Landscaping, Grounds Maintenance, and Urban Forestry

Landscaping and grounds maintenance is defined as landscaping design, construction practices, and pest management intended to enhance wildlife habitat, control soil erosion, and generate long-term cost savings.

Urban forestry is the management of forests and related natural resources within human communities. Urban or community forests include trees, other vegetation, and natural elements of a forest, plus human development, such as roads, buildings, and utilities. Successful urban forestry programs manage these resources so that natural and human-built features enhance each other.

Issues

NSB Kings Bay has created and is successfully implementing a landscape, grounds maintenance, and urban forestry program on the installation within improved and semi-improved areas to protect and enhance wildlife habitat.

Goals, Objectives and Strategies

Table 4-5 identifies the ecosystem management goals, objectives, and strategies (Section 4.1) relevant to the landscaping, grounds maintenance, and urban forestry issue(s) and long-term management.

Table 4-5. Natural Resources Management Goals, Objectives, and Strategies Related to Landscaping, Grounds Maintenance, and Urban Forestry.

Goals	Objectives	Strategies
1	1.2	NSB Kings Bay would maintain an ecosystem management awareness and training/education program available to all interested NSB Kings Bay personnel.
1	1.2	NSB Kings Bay would participate in regional stewardship/research programs that foster citizen participation in ecosystem education and stewardship.
3	3.1	NSB Kings Bay would find opportunities to reduce water usage for protection of water quality.
3	3.2	NSB Kings Bay would implement programs and activities for the protection and enhancement of all habitat for animal and plant species.

Projects and Initiatives

Projects

Participation in the following projects will occur in support of the goals, objectives and strategies for landscaping, grounds maintenance, and urban forestry:

- No. 1 (Invasive Plant Removal)
- No. 2 (Prescribed Burning to Support the Gopher Tortoise CCA)
- No. 3 (Pine Planting to Support the Gopher Tortoise CCA)
- No. 4 (Listed and Species-at-Risk Species Monitoring to Support Military Activities)
- No. 5 (Habitat Improvement Through Forest Management)
- No. 9 (Shoreline and Riparian Conservation)
- No. 10 (Feral, Free-Ranging, and Invasive Animal Control)

Initiatives

1. For program development, enlist the services of foresters, fish and wildlife biologists, landscape architects, and soil conservationists from NAVFAC SE, as well as Federal, state, and county wildlife biologists, foresters, and land managers.
2. Offer hands-on training and individual participation in activities to better demonstrate the concept, application, and importance of ecosystem management. This includes other activities such wetland enhancement (Section 4.3.1.1), reforestation (Section 4.3.2.3), and habitat improvements (Section 4.3.3.1).
3. NSB Kings Bay would consider participation and/or coordination of a regional multi-agency effort to develop a geographic information system (GIS) database to identify wetland types, soils, geologic characteristics, landscape positions, and functional assessment field scores.
4. NSB Kings Bay would cooperate with the University of Georgia during the College of Agricultural and Environmental Studies Soil and Water Stewardship Week each spring.
5. Use volunteers for landscaping, urban forestry or grounds maintenance projects.

Long-Term Management

NSB Kings Bay would utilize the Landscaping/Grounds Maintenance Plan (Section 2.5.4) as its long-term landscape management strategy. This plan incorporates ecosystem management considerations through landscaping and grounds maintenance practices. These practices are presented below in accordance with the desired outcome:

To minimize capital costs by:

- preserving existing vegetation during construction in order to reduce the need for new plant materials;
- using native groundcover and shrubs instead of turf wherever possible to reduce maintenance and irrigation requirements;
- using plant materials to reduce solar loading and glare on buildings, to block winter winds, and to channel winds to enhance summer breezes;
- preserving ground cover and natural drainage, and using drainage channels and retention ponds instead of a closed, expensive system;
- using plant material instead of expensive manmade controls for controlling erosion;
- creating a series of pedestrian nodes where walking and bicycling is encouraged;
- using plant barriers and screens instead of architectural screens.

To maintain an ecological balance within the region by:

- preserving environmentally sensitive areas with high value flora and fauna;
- preserving existing plant materials unless clearing is necessary to allow construction;
- revegetating disturbed areas with indigenous plant materials that promote wildlife habitat; and

- incorporating physical site constraints, such as soils, topography, drainage, and vegetation, into design decisions so as to disturb as little of the ecological balance as possible.

To minimize engineering by:

- using wide, shallow drainage channels planted with native grasses instead of closed systems;
- combining water features with natural drainage systems to provide retention, aesthetic interest, and climatological control;
- breaking up parking lots with planted medians to reduce solar heat buildup and glare;
- replanting disturbed areas immediately to minimize erosion and runoff; and
- hydroseeding dikes with indigenous wildflowers and grasses to stop erosion and slumping of banks.

To enhance the living environment and the aesthetic qualities of the site by:

- creating an identity and sense of place that is indigenous to the coastal environment, and by reducing negative impacts to the greatest degree possible;
- reducing monotonous and repetitive views by creating softer, more natural, cleared woods edges, especially where straight rows of pines have been planted;
- creating and reinforcing outdoor spaces that give a distinctive identity and setting to each area and function;
- enhancing and controlling the site microclimate (wind, humidity, and temperature);
- humanizing and minimizing large paved areas to prevent extensive heat buildup and visual monotony;
- providing seasonal color for interest, variety and focal points; and
- using native materials and local building practices to achieve design continuity and harmony.

Specific Management Practices

NSB Kings Bay would conduct the following actions in support of the landscape and grounds maintenance outcomes listed above: 1) increased use of endemic species; 2) increased coordination of mowing requirements with seasonal wildlife requirements; 3) increased use of green waste as mulch; 4) increased wildflower plantings; and 5) increased landscape activities around installation water bodies.

Native Species

Often, selection of appropriate plant species requires extensive research of site characteristics, plant shape and design, and maintenance requirements. Site characteristics include consideration of the space available, growth characteristics, climate, and the way the plant will interact with its

surroundings. Plant shape and design will be evaluated by considering size, shape, maturity, deciduous or evergreen, growth rate, hardiness, adaptability to soil and climate conditions, habits, and density of shade. Maintenance requirements include the types and extent to appropriately maintain the plant species. After evaluating site and plant characteristics, native plant species will be selected in accordance with the future directives of the Invasive Species Council and in consultation with the Georgia Native Plant Society and the GNHP.

Mowing Activities

Mowing activities on semi-improved lands of NSB Kings Bay would be coordinated with seasonal wildlife habitat requirements; the current July and October mowing schedule accomplishes this, however, the schedule may be modified as new information becomes available. The July mowing would allow ground-nesting birds and mammals adequate time to raise their first brood/litter without disturbance. July mowing would enhance brood rearing for wild turkey and quail by facilitating insect foraging, and would enhance grazing of new plant growth by rabbit and deer. The October mowing would be completed in wildflower plantings, power lines, right-of-ways, unimproved road shoulders, and other areas. Mowing wildflower plots in October would scatter seeds, which attract migratory and song birds, and would promote these areas remaining in an early successional stage for the following nesting season.

Mulching

Current landscaping operations (*e.g.*, weeding, mowing, and pruning) on NSB Kings Bay create moderate amounts of green waste. NSB Kings Bay green waste would be used as mulch for plantings on the installation. Mulching activities offer the following benefits:

- Soil conservation by protecting the soil from moving air currents and the direct rays of the sun, thereby, reducing water evaporation. Mulch prevents falling rain from packing the soil surface and, at the same time, eliminates erosion.
- Reduction in weeding, especially if used in conjunction with a weed killer that kills weeds before germination. It is especially important to mulch rather than cultivate shallow rooted plants such as rhododendrons, azaleas, and camellias.
- Control of soil temperature. Lower and more uniform soil temperatures in summer favor beneficial bacterial activity in the soil. High summer temperatures may injure these microorganisms as well as the roots near the surface of the soil. In winter, frost penetration is less likely to occur in mulched areas. Evergreens must absorb moisture in the winter as well as summer; therefore, winter mulch may prevent the soil water from freezing and becoming unavailable to plants.
- Organic matter used as mulch can improve soil structure and tilth. As it decays, the mulch material works down into the topsoil, adding nutrients to the soil.
- Mulching with materials like pine bark or pine needles can improve appearances.

Wildflower Plantings

Wildflower plantings were initially completed in 1995 in several areas across NSB Kings Bay where grass was considered too costly to maintain. Wildflowers were planted in areas to reduce mowing efforts and expenses, increase wildlife habitat potential, and improve the aesthetic qualities of the installation. Various types of wildlife are attracted to native wildflowers, including numerous birds and insects. These areas also provide excellent locations for bluebird nest boxes (Section 4.3.3), particularly as Eastern bluebird adults and young are insectivorous. Wildflower areas also receive considerable use by martins, swallows, buntings, tanagers, cattle egrets, northern bobwhite, and other insect feeding birds. Because of the overwhelming success of this initiative in increasing wildlife habitat and aesthetic qualities and reducing overall grounds maintenance program costs, NSB Kings Bay would increase the number of wildflower plantings throughout the installation. After evaluating site and plant characteristics, wildflower species will be selected in consultation with the GNHP and the Georgia Native Plant Society.

Increased Landscaping around Installation Water Bodies

Freshwater fisheries on the installation also have specific landscape requirements to increase aesthetic quality, while providing habitat and food for wildlife. To increase the wildlife potential surrounding freshwater fisheries, NSB Kings Bay would be guided by the following basic principles:

- Excessive tree planting around ponds may enhance the growth of filamentous algae and result in undesirably low dissolved oxygen levels (from the use of oxygen by bacteria that consume leaves and other organic material).
- Evergreens will be planted to screen ponds from primary roads. Good evergreen screening species include juniper (*Juniperus virginia* and *J. siliciola*), waxmyrtle (*Myrica cerifera*), pines (*Pinus elliottii* and *P. taeda*), and hollies (*Ilex* spp.). A combination of overstory and understory species forms the best screen.
- Trees and shrubs selected for planting will be wildlife food producers, whenever practical, and should be in accord with the recommended native species for the installation and selected by DoN for management.
- The painted bunting, a neotropical migratory bird (Section 4.3.3.2), which is targeted for management, nests in wax myrtle fringes; therefore, wax myrtles growing along ponds and adjacent woodland borders will be left intact.

Although the golf course is maintained by MWR, the installation would provide appropriate management practices for the golf course that are consistent with the INRMP. Such practices will include allowing more areas to revert to a natural condition, as much as practicable. By doing this, the installation will reduce overall grounds maintenance costs, minimize pesticide and herbicide use,

protect water quality of surrounding water bodies, and increase the overall recreational and aesthetic value of the area as wildlife habitat.

Climate Change

Hotter, drier summers would necessitate the use drought-tolerant plants to maintain an aesthetic landscape. Increased shade tree plantings would also help cool the ground and allow understory landscaping foliage to survive with minimal water. Planting trees and tall shrubs where they can shade windows also helps to mitigate the cost of air conditioning. Permeable surfacing in parking lots would improve natural drainage, benefit the water table, and prevent flooding risks in maintained areas, especially when supplemented by "tree islands" placed throughout the lot. Additionally, permeable surfaces absorb less heat than traditional pavements. Tall grass provides shade on lawns to reduce evaporation from topsoil, so mowing grass to a taller height can help to maintain its health when the weather is dry and hot. Generous mulching also helps to reduce evaporation in garden beds and other vegetated plots.

Environmental Considerations During Management Practices

The potential exists for disturbances to wildlife habitat during landscaping and landscape management (*e.g.*, mulching, mowing, cleaning of drainage structures), as well as for nonpoint source pollution during grounds maintenance activities and construction-type projects.

Applicability of Other Management Issues and NSB Kings Bay Programs

The following management issues, programs, and actions are directly or indirectly related to the management of landscaping, and will be consulted for additional management information, or provided as additional training and education:

- Integrated Pest Management, Section 4.3.1.6 – alternative methods to pesticide use.
- Stormwater, Section 4.3.1.3 – landcaping around stormwater ponds.
- Fish and Wildlife, Section 4.3.3 – habitat enhancement (terrestrial and aquatic), endangered and threatened species.
- Wetlands, Section 4.3.1.1 – landscaping to provide buffers around urban wetlands.
- The NSB Kings Bay Grounds Maintenance Program will be followed for routine maintenance activities (*e.g.*, mowing, pruning).
- The NSB Kings Bay grounds maintenance crew will be educated and trained in the locations and protection of endangered and threatened plant species.
- Hands-on training or individual participation will be offered to volunteer groups, including local Boy Scout troops, and interested base personnel will demonstrate the importance of landscaping activities.

Ecosystem Management

Beneficial landscaping through construction and design practices is consistent with an ecosystem management approach since it reduces the need for irrigation, pesticides, and fertilizers, and relies on the functions and characteristics of native plant species. The use of native species also is recommended for the reduction and control of invasive species. Reducing the demand for irrigation, fertilizers, and pesticides reduces the costs associated with grounds maintenance, and reduces pollutant loading to stormwater runoff and surrounding surface waters and aquatic communities.

Urban forestry supports the ecosystem management concept by providing wildlife habitat through the development of new greenways and managing urban areas for the enhancement of wildlife. Urban forestry also helps reduce stormwater runoff and soil erosion, increases aesthetics and quality of life, and provides habitats for wildlife within the urban area.

Laws, Executive Orders, Regulations, Directives, and Memoranda Relevant to Landscaping

The President's April 16, 1994, Memorandum on Environmentally Beneficial Landscaping, requires implementing landscaping practices that are intended to benefit the environment and generate long-term cost savings.

EO 13112, 3 February 1999, requires executive agencies to restrict the introduction of exotic organisms into natural ecosystems.

Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), 7 USC 136, governs the use and application of pesticides in natural resources management programs.

Federal Water Pollution Control Act as amended by the CWA of 1977, 33 USC 1251, prohibits the discharge of dredged or filled materials into waters of the United States, including wetlands, without first obtaining a permit from USACE (Section 404 of the CWA).

OPNAV M-5090.1D, 12-3.8(e) discusses natural resources management relating to environmentally and economically beneficial landscaping.

DODINST 7310.5 administers the reimbursement of costs related to managing forest resources for timber production. Under this regulation, only expenses related to the maintenance of timber for commercial sale are reimbursed.

OPNAV M-5090.1D, 12-3.8(j) discusses laws that govern natural resources management relating to the protection and management of forest resources.

Additional Sources of Information

Technical Reports/Publications:

Gholson. 1998. The vascular flora of Ichauway, Baker County, Georgia: A remnant longleaf pine/wiregrass ecosystem. *Castanea*. 63:1-24.

Kirkman, L. K., M. B. Drew, L. T. West, and E. R. Blood. 1998. Ecotone characterization between upland longleaf pine/wiregrass stands and seasonally-ponded isolated wetlands. *Wetlands* 18:346-364.

Kirkman, L. K., R. M. Mitchell, R. C. Helton, and M. B. Drew. In review. Productivity controls on plant diversity across an environmental gradient in a fire-dependent ecosystem, submitted to *Ecology*, Florida.

Telephone Contacts and Other Resources:

Camden County Extension Office: (912) 576-3219

Tall Timbers Research Station: (850) 893-4153

TNC Fire Management Office: (850) 668-0827

Georgia Forestry Commission: (912) 576-5387

Alliance for Community Trees (ACT): (800) ACT-8886. ACT provides support for nonprofit organizations involved in planting trees and educating the public about the benefits of trees in urban areas.

National Tree Trust Foundation: (202) 846-TREE. A nonprofit organization that has distributed trees to over 500 community groups across the nation. The Trust planted over 1.1 million trees in 1996.

Internet Addresses:

Where to find native nurseries:
https://gnps.org/

Society for Ecological Restoration
www.ser.org

Association of Native Nurseries:
http://www.afnn.org/

Fire Effects on Plants and Wildlife:
http://www.environment.nsw.gov.au/topics/parks-reserves-and-protected-areas/fire/plants-animals-and-fire

Your Backyard:
http://www.nsis.org

National Arbor Day Foundation - (402) 474-5655
http://www.arborday.org/

A major program of the foundation is the Tree City USA program. Other programs include Tree Line USA, Conservation Trees, Trees for America, Arbor Day Farms, and Rain Forest Rescue.

International Society of Arboriculture - (217) 328-2032,
http://www2.champaign.isa-arbor.com/

A nonprofit organization for municipal foresters and professionals in arboriculture and urban forestry.

Society of Municipal Arborists - (314) 862-1711

The organization's approximately 500 members promote interest in the planting and maintenance of public trees and the preservation of public open space.

4.3.1.5 Floodplain Management

Floodplain management is the operation of an overall program of corrective and preventative measures for reducing flood damage.

Issues

Over the years, substantial development (*i.e.*, grading, filling, dredging, extraction, storage, soil mixing, and the construction or improvement of structures) has occurred within the 100-year floodplain on NSB Kings Bay.

Goals, Objectives and Strategies

Table 4-6 shows the ecosystem management goals, objectives, and strategies (Section 4.1) relevant to floodplain management issue(s) and long-term management.

Table 4-6. Natural Resources Management Goals, Objectives, and Strategies Related to Floodplains.

Goals	Objectives	Strategies
2	2.3	NSB Kings Bay would review all proposed activities for impact avoidance to the attenuation capacity of the 100-year floodplain. If it is determined that development is necessary within the 100-year floodplain to support the military mission, development shall be first located in the previously disturbed areas of the floodplain.
3	3.1	NSB Kings Bay would implement BMPs (GASWCC 2002; GFC 2009; SUBASE 2014) to provide water quality protection for wetlands.
3	3.2	NSB Kings Bay would implement programs and activities for the protection and enhancement of habitat for animal and plant species.

Projects and Initiatives

Projects

Participation in the following projects would occur in support of the goals, objectives and strategies for floodplains:

- No. 1 (Invasive Plant Removal)
- No. 2 (Prescribed Burning to Support the Gopher Tortoise CCA)
- No. 3 (Pine Planting to Support the Gopher Tortoise CCA)
- No. 5 (Habitat Improvement Through Forest Management)
- No. 9 (Shoreline and Riparian Conservation)

Initiatives

1. It would be the responsibility of the Natural Resources staff representative to the Facilities Review Board to ensure implementation of the floodplain management strategy.
2. Map undisturbed and disturbed areas of the 100-year floodplain for use in the decision-making process.
3. Where there is no practical alternative to development in the 100-year floodplain, NSB Kings Bay would design structures to limit or minimize damage caused by flooding and to avoid contamination of waters. NSB Kings Bay would evaluate the county's floodplain regulation, which addresses construction and building codes, as guidance for development in the floodplain.
4. Continue to adhere to the BMPs spelled out in the SWPPP (SUBASE 2014), the *Field Manual for Erosion and Sediment Control in Georgia* (GASWCC 2002), and *Georgia's Best Management Practices for Forestry* (GFC 2009) to control erosion, sedimentation, and stormwater runoff in floodplains.
5. Retain the natural attenuation and filtering capacity of wetlands within the 100-year floodplain.
    - Ensure no net loss of wetlands.
    - Ensure adequate buffers around and prescribed burns through wetland areas to maintain wetland attenuation capacity.

Long-Term Management

NSB Kings Bay would avoid construction or management practices that adversely affect the attenuation capacity of the 100-year floodplain, unless NSB Kings Bay concludes that: 1) there is no practical alternative, or 2) the proposed action has been designed to minimize harm to or within the floodplain. To enforce this, preferred sites for development would be located outside the 100-year floodplain. If there is no suitable location outside the 100-year floodplain that would satisfy the need of the NSB Kings Bay military mission (*e.g.*, proximity to dependent function), preferred sites for development would be within previously disturbed areas of the 100-year floodplain. For all development within the 100-year floodplain, NSB Kings Bay would evaluate alternatives and techniques for controlling and reducing the potential for flood damages. NSB Kings Bay would evaluate the use of the county's floodplain regulation as guidance for development in the floodplain. Consistent with the DoN's policy of no net loss of wetlands, NSB Kings Bay would avoid any construction in wetlands within the 100-year floodplain. Wetlands play an important role in flood control by providing storage, slowing flood waters, reducing flood peaks, and increasing flow duration (Section 4.3.1.1).

Environmental Considerations During Management Practices

None.

Applicability of Other Management Issues

The following management issues, programs, and actions are directly or indirectly related to floodplain management and will be consulted for additional management information or provided as additional training and education:

- Wetlands, Section 4.3.1.1 – wetlands for flood attenuation.
- Habitat Enhancement, Section 4.3.3.1 – water quality protection.
- Freshwater Fisheries, Section 4.3.3.5 – water quality protection.

Climate Change

Several recent rainfall events in southeastern states have been classified as having a 1-in-500 and even 1-in 1,000 chance of occurring in a given year. Hurricane Irma in 2017 flooded portions of nearby Jacksonville, Florida, that had never flooded in recorded history. Such events may be expected to become even more frequent as global temperatures continue trending up since warmer air increases the evaporation rate of water. For every degree Celsius increase in temperature, a parcel of air can hold 7 percent more water. Average annual rainfall across the United States has gone up by 5 percent since 1990, with regional variation, according to the National Climate Assessment.

The position of NSB Kings Bay on Cumberland Sound should help to mitigate flooding due to rainfall, as excess rain water has only a short distance to flow into the estuary. Utilizing permeable surfaces whenever possible would also help in this regard.

While NSB Kings Bay's position on the coast helps to alleviate the impact of excess rain water, it also subjects the installation to storm surge from tropical weather systems. The online NOAA Sea Level Rise Viewer indicates that a surge of six feet would inundate portions of the southern waterfront and entrain storm surge behind the dredge spoil areas via the North River. Maintaining the natural wetlands function of the North River would help ensure that storm surge is dissipated as efficiently as possible.

Ecosystem Management

Proper management of the 100-year floodplain is an essential ecosystem management concept. Floodplains perform important natural functions, including temporary storage of floodwaters, moderation of peak flows, maintenance of water quality, groundwater recharge, and erosion prevention. Also, floodplains provide habitat for wildlife, recreational opportunities, aesthetic benefits, and areas of archaeological significance

Laws, Executive Orders, Regulations, Directives, and Memoranda Relevant to Floodplains

EO 11988, Floodplain Management, May 24, 1977, requires Federal service agencies to avoid construction or management practices that will adversely affect floodplains, unless it is found that: 1) there is no practical alternative, and 2) the proposed action has been designed to minimize harm to or within the floodplain.

OPNAV M-5090.1D, 12-3.8(c), discusses natural resources management relating to floodplain management

Additional Sources of Information

FEMA's Floodplain Management Summary:
https://www.fema.gov/floodplain-management-publications

Strategies for floodplain management:
http://www.floodplain.org/

4.3.1.6 Integrated Pest Management (IPM)

IPM is a socially acceptable, environmentally responsible, and economically practical method of controlling pest populations. IPM incorporates a variety of cultural, biological, and chemical methods to efficiently manage pest populations while lowering dependence on chemical controls.

Issue

A number of pests and exotic species (*e.g.*, fire ants, mole crickets, aphids, and mosquitoes) occur on the installation, and the control of these pests and exotics is an integral part of ecosystem management practices on NSB Kings Bay.

Goals, Objectives and Strategies

Table 4-7 shows the ecosystem management goals, objectives, and strategies (Section 4.1) relevant to IPM issue(s) and long-term management.

Table 4-7. Natural Resources Management Goals, Objectives, and Strategies Related to Integrated Pest Management.

Goals	Objectives	Strategies
2	2.2	NSB Kings Bay would continue to implement and update when necessary, the long-term management plan to protect and conserve the natural functions of wetlands and shoreline areas, including limiting wetland shoreline destruction and reducing adverse impacts to water quality.
2	2.2	NSB Kings Bay would inventory the use of pesticides and fertilizers on NSB Kings Bay. NSB Kings Bay would continue to assess alternatives to and a reduction in pesticide and fertilizer use. The intent is to reduce chemical pesticide and fertilizer use to help protect water quality.

Table 4-7, continued.

Goals	Objectives	Strategies
2	2.3	NSB Kings Bay would review all proposed activities for impact avoidance to the attenuation capacity of the 100-year floodplain. If it is determined that development is necessary within the 100-year floodplain to support the military mission, development shall be first located in the previously disturbed areas of the floodplain.
3	3.1	NSB Kings Bay would implement BMPs (GASWCC 2002; GFC 2009; SUBASE 2014) to provide water quality protection for wetlands.
3	3.2	NSB Kings Bay would implement programs and activities for the protection and enhancement of habitat for animal and plant species.

Projects and Initiatives

Projects

Participation in the following projects will occur in support of the goals, objectives and strategies for integrated pest management:

- No. 1 (Invasive Plant Removal)
- No. 2 (Prescribed Burning to Support the Gopher Tortoise CCA)
- No. 3 (Pine Planting to Support the Gopher Tortoise CCA)
- No. 5 (Habitat Improvement Through Forest Management)
- No. 9 (Shoreline and Riparian Conservation)

Initiatives

1. NSB Kings Bay would periodically update the existing IPM plan to incorporate the most recent research on monitoring and forecasting methods and removal of exotic faunal pests on the installation. NSB Kings Bay would use education and research, as well as training, for on base land managers.
2. Continue to maintain environmental representation on the Facilities Review Board.
3. NSB Kings Bay would update periodically the inventory of pesticide and fertilizer use and consult NAVFAC SE (843-820-7140) and the FDACS Pesticide Division (850-487-2130) for means of reduction.
4. Evaluate the use of a combination of organic and mineral fertilizers. Slow release fertilizers will be preferred to other mineral fertilizers.
5. Consider non-pesticide removal methods or removal using pesticides with lower toxicity applied at reduced rates.
    - Consult with foresters, fish and wildlife biologists, and soil conservationists from NAVFAC SE, as well as with Federal, state, and county wildlife biologists, foresters, and land managers.
    - Coordinate with MWR to establish and implement alternatives to minimize pesticide usage on the installation golf course and other MWR-maintained properties.
6. It is the responsibility of the Natural Resources staff representative to the Facilities Review Board to ensure implementation of the IPM strategy.

Long-Term Management

NSB Kings Bay would use recommended IPM practices to control pests, and invasive and exotic species occurring on NSB Kings Bay. The primary NSB Kings Bay pests and exotics include fire ants, mole crickets, aphids, and mosquitoes; one method for controlling these species will be the introduction of beneficial species (*e.g.*, ladybugs, nematodes, and mosquito fish [*Gambusia affinis*]). Methods for controlling insect pest populations are described below.

NSB Kings Bay mosquito populations would be controlled via the continuation of the nest-box program for bluebirds, bats, and other bird species (Section 4.3.3) and the possible introduction of mosquito fish into ponds not suitable for recreational fishing (Section 4.4.3.5). Mosquito fish prefer the cover and protection of shallow overgrown areas along the shore where mosquito larvae are found. Mosquito fish are hardy and can live in many types of aquatic habitats for several years. It is important to note that mosquito fish are not limited to mosquito larvae, and also feed on the fry and eggs of other fish.

Because of the technical nature of this program, NSB Kings Bay would consult local academic institutions (*e.g.,* University of Georgia and Valdosta State) and other sources of technical information to remain advised of current IPM techniques. Additionally, installation grounds managers would be provided with continual training and education on the most recent IPM techniques and issues. The NSB Kings Bay IPM program would:

- Monitor and forecast pest populations to determine whether insect infestations are present, and if so, the type of pests, degree of infestation (small, medium, or large), and the size of the area or number of plants under attack;
- Use thresholds during decision making;
- Emphasize prevention via cultural and other controls vs. treatments (discussion below);
- Maintain records/documentation of pest management actions;
- Utilize least-toxic and least environmentally disruptive practices;
- Practice resistance management;
- Use BMPs for soil conservation, water use/protection, and nutrient management (Section 4.3.1.2);
- Use BMPs for pesticide management, such as:
    - using appropriate tools for spraying,
    - calibrating sprayers,
    - obtaining required education, Pesticide Application Training regarding pesticide use,
    - ensuring proper pesticide handling and storage,
    - adhering to worker protection standards,
    - practicing drift reduction techniques, and

- considering special circumstances, off-site impacts, proximity to urban areas, and endangered species.

- Ensure ongoing education of IPM applicators; and
- Integrate pest management practices into a total management system.

Prevention via Cultural and Other Controls

The following control methods would be considered for use on the installation to prevent and control populations of invasive and exotic pests. Use of these measures would be discussed with experts in the field of IPM, and would be implemented at the discretion of the installation Natural Resources Manager and the Landscape Grounds Maintenance Manager.

Chemical Controls

The use of chemical pesticides often forms part of an IPM strategy. The key is to use pesticides to complement, rather than hinder, other strategy elements and to limit negative environmental effects. It is also important to understand the life cycle of a pest so that the pesticide can be applied when the pest is at its most vulnerable, and to achieve maximum effect at minimum levels of pesticide. Chemical controls include the following:

- conventional – include carbamates, chlorinated hydrocarbons, some botanicals and analogs, new compounds; and
- biorational – include pheromones, antifeedants, heat/cold, minerals, oils, some botanicals, and microbials

Cultural Controls

These control measures include plant variety and site selection rotations, cultivations, and sanitation. These control measures are often referred to as the older forms of pest control.

Biological Controls

Biological insect control is a strategy of management that maintains pests at levels that do not cause great economic or aesthetic losses. The principle behind biological pest control is that a given pest species has biological agents that can control its population, such as predators, parasites, and/or pathogens. By introducing or encouraging such agents, the population of pest organisms should decline. There are three general approaches to biological pest control: importation, augmentation, and conservation.

Importation. Importation involves importing a specific organism to control another; however, there are dangers with this approach. This method requires extensive research before a control organism is released in order to determine whether it will attack species other than the pest species. When introducing new biological control agents into the area, the following will be considered:

- *Releasing* beneficial insects and mites is most effective when pest populations are low to medium. Therefore, biological control agents should be introduced at the first sign of pests.
- *Application rates of organisms* should be carefully considered. Begin by releasing the higher recommendations, then cut back to smaller periodic releases, as necessary. Also, consider preventative introductions when appropriate.
- *Maintaining a suitable environment* that favors the naturally occurring biological control agents as well as those that are introduced. Food, water, shelter, and a poison-free environment are principle requirements for survival.

Augmentation. Augmentation consists of manipulating existing native biological control agents to increase their effectiveness. This can be achieved by mass production, genetic enhancement, and/or periodic release of native biological control agents.

Conservation. Conservation involves identifying and modifying factors that may limit the effectiveness of native biological control agents. In some situations, this may include reducing the application of pesticides, as pesticides may kill beneficial control agents as well as killing pests. Sometimes part of a crop area is left untreated so that native biological control agents will survive and recolonize the treated areas.

Genetic Controls

Genetic controls include the transfer of resistance genes into a plant, or the engineering of a disadvantageous trait in the pest, then releasing modified individuals into the pest control area. Another method is the introduction of sterile members of the pest species.

Physical-Mechanical Controls

Physical-mechanical controls include controls that alter environmental factors in a way that reduces pest populations. These controls may be performed by the individual groundskeeper; examples include crop rotation and pruning. Another physical control method, sometimes called "mating disruption," involves the use of sex pheromones produced by females to attract males for mating. Many of these pheromones are reproduced synthetically in the laboratory and are available commercially. Quantities of the pheromone placed around an orchard can disrupt mating by confusing male insects, which are then less likely to find a mate.

Environmental Considerations During Management Practices

These management practices are potentially damaging to non-target species, their habitat and water quality.

Applicability of Other Management Issues

The following management issues, programs, and actions are directly or indirectly related to IPM, and would be consulted for additional management information or provided as additional training and education:

- Wetlands, Section 4.3.1.1 – protection of water quality in wetland areas.
- Stormwater, Section 4.3.1.3 – reduction in the use of pesticides.
- Habitat Enhancement, Section 4.3.3.1 – reducing competition for vital resources.
- Landscape, Grounds Maintenance, and Urban Forestry, Section 4.3.1.4 – reducing overall costs of grounds maintenance.

Climate Change

Plants and insects depend on climatic factors such as temperature, sunlight, precipitation, relative humidity and carbon dioxide for their development. Insect growth occurs only above a minimum temperature threshold and their rate of growth increases with warming temperatures up to a maximum threshold, which is species-specific. Climate change may therefore be expected to increase the growth rate and proliferation of various insect pests, and may even facilitate the introduction of pests that were intolerant of previously-existing temperature and precipitation regimes.

Ecosystem Management

The management of exotic and invasive fauna is a fundamental component of the ecosystem management concept. Because invasive species, by definition, typically out-reproduce native species, the eradication of invasives is essential for the protection and enhancement of biodiversity at NSB Kings Bay and in the region. IPM practices discourage pesticide resistance and reduce chemical costs, human exposure to pesticides, and overall environmental impacts associated with pest management.

Laws, Executive Orders, Regulations, Directives, and Memoranda Relevant to Floodplains

EO 11988, Floodplain Management, May 24, 1977, requires Federal service agencies to avoid construction or management practices that will adversely affect floodplains, unless it is found that: 1) there is no practical alternative, and 2) the proposed action has been designed to minimize harm to or within the floodplain.

OPNAV M-5090.1D, 12-3.8(c), discusses natural resources management relating to floodplain management.

Additional Sources of Information

Internet Addresses:

National Integrated Pest Management Network:

http://www.sripmc.org/?CFID=278585&CFTOKEN=40573295

Cooperative Extension Office:
http://www.caes.uga.edu/extension/

University of Georgia Entomology:
http://www.ent.uga.edu/

Aphid control measures:
http://attra.ncat.org/attra-pub/gh-aphid.html

Biological Control Virtual Information Center
http://agris.fao.org/agris-search/search.do?recordID=US201300078353

Consortium for International Crop Protection IPMnet
http://www.ipmnet.org/

Ecological Agriculture Projects (EAP)
http://eap.mcgill.ca/

Bio-Integral Resource Center (BIRC)
http://www.birc.org/

Chesapeake (Bay) Information Management System
http://www.chesapeakebay.net/

Midwest Biological Control News
http://www.entomology.wisc.edu/mbcn/mbcn.html/

National Park Service Northeastern Area Forest Health Page
http://www.na.fs.fed.us/fhp/index.shtm

Sustainable Agriculture Network
http://www.sare.org/

USDA National Agricultural Statistics Service (NASS)
https://www.nass.usda.gov/

IPM Collaborative Research Support Program Bibliography Service
http://ento.psu.edu/

IPM Software Sites:

University of Florida's Buggy Software Website
https://entnemdept.ifas.ufl.edu/news/news/Bug_Tutorials.htm

Purdue's Landscape IPM Software
https://www.extension.purdue.edu/ipm/ipm1_5.html

IPM/Biological Control Product Sites:

Beneficial Insectary
https://www.insectary.com/

IPM Laboratories, Inc.

http://www.ipmlabs.com/

Tanglefoot Company
http://www.tanglefoot.com/

Trécé Incorporated

http://www.trece.com/

Bioscape, Inc.
http://bioscape.com/index.asp

Gempler's Pest Control
https://www.gemplers.com/pest-mgmt

Crop Data Management Systems, Inc.
http://www.cdms.net/pfa/LUpdateMsg.asp

4.3.2 Forest Management

Forest management generally involves actions for the commercial production and sale of forest products and includes practices such as timber sales, reforestation, and timber stand improvement. Because of the significant forest resources on the installation and their regional importance, management emphasis of NSB Kings Bay forest stands is wildlife habitat and timber production.

4.3.2.1 Stand Improvement Practices

Timber stand management on NSB Kings Bay generally involves actions to improve merchantable timber and wildlife habitat by altering forest stand composition and density. The primary management tools for accomplishing this are prescribed burns and timber harvest operations.

Issue

Timber stands on NSB Kings Bay require periodic maintenance. Maintenance neglect represents a threat to the military mission and to the sustainability of forest and wildlife resources. Because of the diversity in forest stands on NSB Kings Bay, different management practices are required to achieve desired outcomes.

Goals, Objectives and Strategies

Table 4-8 indicates the natural resources management goals, objectives, and strategies (Section 4.1) relevant to timber stand and wildlife habitat improvement issue(s) and long-term management.

Table 4-8. Natural Resources Management Goals, Objectives, and Strategies Related to Forest Management Practices.

Goals	Objectives	Strategies
2	2.1	NSB Kings Bay has a number of pests and exotic species (*e.g.*, fire ants, mole crickets, aphids, and mosquitoes) that occur on the installation and the control of these pests and exotics is an integral ecosystem management practice on NSB Kings Bay.
2	2.1	NSB Kings Bay would continue to implement and update when necessary, the long-term management plan to protect and conserve the natural functions of wetlands and shoreline areas, including limiting wetland shoreline destruction and reducing adverse impacts to water quality.
2	2.3	NSB Kings Bay would review all proposed activities for impact avoidance to the attenuation capacity of the 100-year floodplain. If it is determined that development is necessary within the 100-year floodplain to support the military mission, development shall be first located in the previously disturbed areas of the floodplain.
3	3.1	Continue to establish and implement specific BMPs for the protection of water quality on all NSB Kings Bay (*e.g.*, wetlands, salt marsh and freshwater ponds) and surrounding water bodies (*e.g.*, Kings Bay and Cumberland Sound).
3	3.2	NSB Kings Bay would implement programs and activities for the protection and enhancement of habitat for animal and plant species.
3	3.3	NSB Kings Bay would implement programs and activities for the enhancement of habitat for fish and game species.

Projects and Initiatives

Projects

Participation in the following projects will occur in support of the goals, objectives and strategies for stand improvement practices:

- No. 1 (Invasive Plant Removal)
- No. 2 (Prescribed Burning to Support the Gopher Tortoise CCA)
- No. 3 (Pine Planting to Support the Gopher Tortoise CCA)
- No. 4 (Listed and Species-at-Risk Species Monitoring to Support Military Activities)
- No. 5 (Habitat Improvement Through Forest Management)
- No. 10 (Feral, Free-Ranging, and Invasive Animal Control)

Initiatives

1. Refine and implement the existing prescribed burning regime to adequately address forest and wildlife needs. Prescribed burns will be conducted by trained personnel and burn schedule may be adjusted to accommodate fuel-reduction burns and site safety concerns.
2. Manage longleaf pine stands. Management practices will include prescribed burns and infrequent timber harvests.

3. Consult with foresters, fish and wildlife biologists, and soil conservationists from NAVFAC SE, as well as Federal, state and county wildlife biologists, foresters and land managers.
4. Consider the one-month Federal course offered by the Florida Department of Agriculture and Consumer Services (FDACS), Division of Forestry in Tallahassee.
5. Adhere to the BMPs in *Georgia's Best Management Practices for Forestry* (GFC 2009) to control erosion and sedimentation associated with stand improvement practices.
6. Encourage the use of volunteers for wildlife habitat and timber stand improvements.

Long-Term Management

NSB Kings Bay would implement forest stand improvement practices for timber (TSI) and wildlife habitat improvement (WHI). The goal of both practices is to promote a diversity of successional stages while sustaining merchantable timber resources. Although improvement practices for TSI and WHI are similar, the objectives often differ. TSI practices emphasize retention of high grade trees and reduction of competition to increase growth, volume, and market value of trees. WHI practices emphasize manipulation of forest structure and composition to provide food and cover resources for wildlife. NSB Kings Bay will implement TSI and WHI to achieve the desired outcome for each forest stand as determined by the Natural Resources Manager.

Stand Improvement Tools

NSB Kings Bay will use various types of forestry practices as stand improvement tools for timber and wildlife. *Prescribed burning* is the purposeful application of fire in a controlled, knowledgeable manner to forest fuels on a specific land area under selected weather conditions to accomplish predetermined, well-defined management objectives. A prescribed burn involves running low-intensity surface fires through forest stands. Prescribed burning enhances horizontal diversity by stimulating growth of forbs, grasses, and other early successional herbaceous vegetation that provide valuable food and cover for wildlife. Prescribed burns also remove undesirable trees and/or trees of little monetary value and will serve as catalysts nutrient release contained in dead organic material on the forest floor.

Timber harvest techniques to be utilized on NSB Kings Bay include mid-rotation thinning, seed-tree harvest, and even-aged harvest. Prescribed burns and harvests are utilized to improve growth of merchantable trees, reduce stand density, and improve food and cover for wildlife.

Prescribed Burning

Of all the natural communities on the installation (Section 3.4), pine flatwood forest and pine plantations are primarily where prescribed burns will be completed. These communities include slash pine, longleaf pine, and loblolly pine and comprise a major portion of all timber stands on the

installation. Various types of fires (*e.g.*, backing, flanking, strip fires, night fires, or aerial ignition) would be utilized as determined by the NSB Kings Bay Natural Resources Manager. Primary fire types include backing or flanking fires, and if conditions are favorable, staff may utilize strip fires in tracts of 50 acres or less.

For prescribed burns to be an effective management technique, careful planning, and consideration will be given to specific areas that will benefit most from burning. In addition, NSB Kings Bay would:

1. Evaluate each area to be burned. Timber stands and other areas will be evaluated before the burning season to determine current conditions and needs. Biological requirements and existing vegetative conditions will be evaluated. The biological requirements of species that have conservation priority (e.g. gopher tortoise) will be considered and incorporated into the prescription. In addition, spring and summer burns often coincide with the nesting season of many ground-nesting bird species (*e.g.*, bobwhite quail, turkey, Chuck-will's-widow, and Bachman's sparrow).

   The vegetation conditions of the stand to be burned will be considered and incorporated into the prescription. Conditions include moisture content, ground cover and mid-story density, and presence of snags, litter, and vegetative debris.

2. Prioritize areas that need burning. If several areas need to be burned, NSB Kings Bay will give higher priority to sites having the greatest need for burning, such as areas that require specific weather conditions, fuel loads (lots of dead organic matter), tree density, terrain, potential for smoke problems, and sensitive features that need to be protected from fire.

3. Develop a written burn plan. A prescribed burn plan will be written by the Natural Resources Manager and forwarded to the Commanding Office for approval in December of each year. This plan will detail stands to be burned, necessary weather conditions, ignition methods, safety considerations, and other pertinent information.

As weather and site conditions for prescribed burns permit, NSB Kings Bay pine flatwoods and pine plantations will be burned on a two-to-three-year rotation, with a goal of a 40-to-60-percent reduction in the understory. Prescribed burns may occur at any time of year; if practical, growing season burns (March-April) will be conducted in stands containing gopher tortoise populations. Over the past several years, the amount of forest land burned has decreased primarily due to restrictive weather conditions, personnel limitations, and time constraints.

Timber Harvesting

Routine timber harvest will be limited to the pine stands, and would be accomplished by utilizing seed tree and even-aged cuts. Pine flatwoods and pine plantation, may require an initial commercial thinning once a stand reaches merchantable size (approximately 13 to 15 years), with successive thinnings every 7 to 10 years based on individual stand prescriptions. The final harvest will occur at or near the rotation age (at least 50 years for pine and 80 years for hardwoods based on current stand growth as determined by the Natural Resources

Manager). The Natural Resources Manager will utilize periodic thinnings or some small group selection cuts of mixed hardwood stands as necessary to promote forest health and allow some long-lived hardwood species to persist beyond the rotational age. No harvest practices have been identified for early successional systems, wooded swamps, pond/fresh marsh, and salt marsh; however, the installation will perform prescribed burns as determined necessary by the NSB Kings Bay Natural Resources Manager. Management objectives include the gradual replacement of planted slash and loblolly pine stands with longleaf pine-dominated stands maintained by infrequent harvests.

Timber harvesting on NSB Kings Bay are either intermediate or regeneration cuttings. *Intermediate cuttings* are designed to improve existing stands, and include thinnings, improvement cuttings, and salvage cuttings. *Regeneration cuttings* remove mature and over-mature trees in a stand to facilitate regeneration of the desired species; regeneration cuttings include clear cutting, seed tree cuts, shelterwood cuts, group selection, and single tree selection.

Intermediate Thinning

Thinnings occur within immature stands to increase the rate and quality of growth, and to improve stand composition. A thinning may be the removal of an entire row of trees (*e.g.*, third, fifth, and seventh) or the removal of selected trees. Thinned areas may be used as wildlife food plots to increase wildlife occurrence within forest habitats (Section 4.3.3). Thinning redistributes the growth potential of the site to the remaining trees so that they grow at a faster rate; thinning also increases sunlight penetration to the forest floor, stimulating understory growth, and creating food and cover for some wildlife species. It should also be emphasized that timing of thinnings is important. Selection of the right time for thinnings may also reduce the susceptibility of forest stands to pests and diseases.

Improvement cuttings are made in stands older than the sapling stage, usually to improve the composition. This type of cut is usually applied to wild stands being placed under management and involves removal of undesirable species (*e.g.*, diseased, mechanically injured, unthrifty). Thinnings and improvement cuttings are usually done concurrently.

Salvage harvests remove dead, injured, or deteriorating trees in order to utilize them before they become nonmerchantable.

Regeneration Harvest

When deciding which regeneration methods to use, the installation will consider the predominant tree species, site characteristics, condition of the existing forest, DoN activities, and economics.

Even-aged harvests remove of all trees from a given area, usually with reforestation by planting nursery-grown seedlings in rows. Because of all trees are removed, intensive mechanical site preparation can be conducted without harming residual trees. Mechanical site preparation can

substantially reduce the abundance of understory vegetation, such as saw-palmetto, in the regenerating stand. Even-aged harvesting is required to convert slash or loblolly pine dominated stands to longleaf stands.

Seed tree harvests result in the removal of all trees except a small number of seed bearers. This method is normally used for trees that have light seeds easily dispersed, such as loblolly pine. A seed tree harvest should not be done in wet or shallow sandy soils as these sites do not promote strong roots, which could contribute to wind damage. Seed trees may be left individually, or in groups of six to eight trees if wind throw may be a problem. If groups are left, they should consist of 8- to 12-inch-diameter trees with two to three groups per acre.

Shelterwood harvests, a modification of the seed tree harvest, leave larger numbers of seed trees to shelter the growth and development of younger trees. Shelterwood harvesting is one of the more complex methods of regenerating trees, and is typically used to regenerate semi-shade-tolerant and shade-tolerant species. Studies have also determined that shelterwood harvests, if done properly, can enhance oak regeneration efforts.

Group selection harvests remove small groups of trees periodically, and produces uneven-aged forests composed of small areas with even-aged groups. Group selection involves the removal of clusters of trees in an area less than two acres and resembles a small-scale, even-aged harvest.

Single-tree selection removes single trees randomly and produces uneven-aged conditions throughout the forest.

Environmental Considerations During Management Practices

Potential impacts to wildlife habitat and potential increases in soil erosion, stormwater runoff, and invasive species may occur. Potential impact to the military mission may result from prescribed burn smoke or an uncontrolled prescribed burn.

Applicability of Other Management Issues and NSB Kings Bay Programs

The following management areas are either directly or indirectly related to the implementation of TSI and WHI practices, and will be consulted for additional information:

- Threatened and Endangered Species, Section 4.3.3.2 — TSI and WSI requirements for species.
- Habitat Management, Section 4.3.3.3 — habitat enhancement for game and non-game species during TSI and WSI activities.
- Soil Conservation, Section 4.3.1.2 — implement BMPs for forest management activities.
- Wetlands, Section 4.3.1.1 — water quality protection within wetland systems.
- Offer hands-on training or individual participation to better demonstrate the concept, application and importance of TSI and WSI activities.

Climate Change

As sea level rises, waves and seawater will push farther inland, flooding more land, eroding shorelines, and salinizing freshwater wetlands and aquifers. Salt intolerant tree species will decline, along coastal areas. Drier summers will continue to stress young and mature trees and increase the risk of wildfires and insect infestations; however, the extra autumn rains may help to establish fall tree plantings and help mature trees prepare for the winter dormant season.

Managed forests require decades to reach maturity, so preparing for climate change now will save time and money in the long term, improve forest health, and reduce the risk of future losses. Timber stand improvement actions that can help mitigate the impacts of climate change include:

- Manage for a healthy density. Keep trees vigorous to better resist pests and survive in the face of disturbances. Thinning for timber stand improvement reduces stress and keeps forests at reasonable densities, species composition, and age class structure.
- Diversify species. When planting, consider species likely to be successful even if the range of species is expected to change over time with climate change.
- Design for wind. Reduce risk of wind-thrown trees by having gradual transitions from short to tall vegetation at the edges of woodland stands.
- Consider storm surges and sea level rise. Plan for species with higher flooding and salt tolerances in flood-prone tidal areas.
- Choose drought-resistant species if it becomes clear that southeastern Georgia will be more prone to drought. Techniques like using root gels or watering newly-planted seedlings during a dry summer can help improve survival.
- Diversify stand ages and structure. Stands of different ages and species will not all be susceptible to the same damage. Thinning, harvesting, and planting all provide opportunities to create diversity.
- Build connectivity. Connected woodland parcels allow tree species and wildlife to migrate more easily, which encourages greater diversity.
- Learn how to control invasive species. The species, season, and desired control method can all help to avoid wasting time and money.
- Monitor for disease and insects. A small problem is easier and less expensive to control.
- Control invasive vines. Vines can completely overgrow trees, shading out their canopy and increasing risk of damage from wind.
- Manage deer. Too many deer usually results in too few young trees and the loss of the understory in the woods.
- Plan fuel breaks. Fuel breaks such as well-maintained roads or a thinned area can make it more difficult for wildland fires to spread.

Ecosystem Management

TSI and WHI activities increase the growth potential of selected trees, reduce understory competition, and increase habitats for game and non-game wildlife.

4.3.2.2 Land Treatment Area Forests

The NSB Kings Bay land treatment system was established to treat wastewater from the upper base. Wastewater is pretreated by an aerobic facultative lagoon, and chlorinated prior to application on eleven operational blocks, each containing approximately 25 to 40 acres of loblolly and slash pines.

Issue

NSB Kings Bay land application areas will require intensive forest management practices to ensure the maximum water filtration is maintained.

Goals, Objectives and Strategies

Table 4-9 indicates the natural resources management goals, objectives, and strategies (Section 4.1) relevant to land treatment system issue and long-term management.

Table 4-9. Natural Resources Management Goals, Objectives, and Strategies Related to Land Treatment Forests.

Goals	Objectives	Strategies
3	3.1	Continue existing timber stand and wildlife stand improvement practices using prescribed burns and thinnings to achieve individual stand objectives, including the enhancement of habitat, maximizing sustained yield, enhancing multiple use management, reducing the potential for wildfires, and controlling diseases and insect pests.
3	3.1	Continue to establish and implement specific BMPs for the protection of water quality on all NSB Kings Bay (*e.g.*, wetlands, salt marsh and freshwater ponds) and surrounding water bodies (*e.g.*, Kings Bay and Cumberland Sound).
3	3.1	Water quality protection using BMPs (GASWCC 2002; GFC 2009; SUBASE 2014).
3	3.4	NSB Kings Bay would implement appropriate measures to protect water quality of installation fishery resources.

Projects and Initiatives

Projects

Participation in the following projects will occur in support of the goals, objectives and strategies for land treatment forests:

- No. 1 (Invasive Plant Removal)

- No. 2 (Prescribed Burning to Support the Gopher Tortoise CCA)
- No. 3 (Pine Planting to Support the Gopher Tortoise CCA)
- No. 4 (Listed and Species-at-Risk Species Monitoring to Support Military Activities)
- No. 5 (Habitat Improvement Through Forest Management)
- No. 10 (Feral, Free-Ranging, and Invasive Animal Control)

Initiatives

NSB Kings Bay would, in consultation with foresters and wildlife biologists from NAVFAC SE, as well as Federal, state, and county wildlife biologists and foresters:

1. Prepare timber harvests using existing NSB Kings Bay FMIS data and FMIS data to be collected under Projects No. 2 and 3 (see Section 6). These stands are not prescribed burned, as there are too many sprinkler heads.
2. Certify additional NSB Kings Bay personnel in prescribed burning.

Long-Term Management

In forested areas designated for land treatment application of wastewater, NSB Kings Bay would, to the extent practicable:

- Schedule harvest following a prescribed plan so that one block will be under harvest and site regeneration every two to three years. Irrigation requirements will change during site regeneration and so irrigation practice will accord with tree needs. Once trees reach about one year, irrigation will recommence at the regular schedule and hydraulic loading.
- Accomplish harvesting using feller-bunchers and support skidders. The preferred method is whole tree harvesting, in which the above-ground waste is chipped and removed from the site. This will improve the long-term filtration capacity. Whenever possible, all equipment would be operated parallel to the sprinkler lines and drainage ditches.
- Prepare the site following harvest by roller drum-chopping and conducting an intensive burn to deplete remaining slash. If whole tree harvesting is used, an intensive burn may not be necessary; a light burn may be more appropriate following harvest if sufficient sprouting of hardwoods or other competing species has occurred. The base forester would determine the proper prescription for each site on an individual basis.
- Complete regeneration by the machine planting method. Alternative regeneration practices may be considered, but the objective of wastewater renovation must remain the primary objective.
- Develop a general plan to encompass one complete harvest rotation of the land treatment site. The plan would include the blocks and years to be harvested. A more detailed 5-year plan will be prepared and updated each year.
- Develop a management plan for the system buffer areas.

Environmental Considerations During Management Practices

Potential impacts to wildlife habitat, and potential increases in soil erosion, stormwater runoff, and invasive species may occur during burning and/or cutting activities.

Applicability of Other Management Issues

The following management issues, programs, and actions are directly or indirectly related to reforestation management, and would be consulted for additional management information or provided as additional training and education:

- Timber Stand Improvement, Section 4.3.2.1 – prescribed burns for site preparation.
- Stormwater, Section 4.3.1.3 – potential increase in sedimentation during forest management activities.
- Soil Conservation, Section 4.3.1.2 – increase in erosion and land disturbance during forest management activities.
- Habitat Enhancement, Section 4.3.3.1 – habitat reduction because this area is managed for wastewater renovation.
- SWPPP BMPs (SUBASE 2014) for stormwater runoff and soil conservation and erosion.
- Creation of SWPPP BMPs for the land application area to minimize effects of intensive forest management practices.
- Wetlands, Section 4.3.1.1 – protects water quality and wetlands.

Climate Change

The same management considerations that would facilitate effective timber stand improvement as the climate changes (see Section 4.3.2.1) would also be effective in managing land treatment area forests.

Ecosystem Management

NSB Kings Bay land application activities minimize the disposal of wastewater in surrounding water bodies protecting the recreational and wildlife potential of these aquatic systems.

Additional Sources of Information

Telephone Contact:

USDA Forest Service, Region 8: (404) 347-4177

Georgia State Office – USDA NRCS: (706) 546-2272

Georgia Forestry Commission: (912) 576-5387

University of Georgia, School of Forest Resources:

Technical Reports/Publications:

Final Report: Evaluation of the Forest Land Treatment System and Recommendations for Management, Nutter, Wade and Red, Jane, University of Georgia School of Forest Resources, June 1986.

Managing Wildlife, Alabama Wildlife Federation, 1999.

Internet Addresses:

Mississippi State University, Department of Forestry:
http://www.cfr.msstate.edu/forestry/

The Longleaf Alliance
www.longleafalliance.org

4.3.2.3 Reforestation

Reforestation is the renewal of a forest by either natural or artificial means. Reforestation is normally preceded by an even-aged harvest, a seed tree harvest, or shelterwood harvest.

Issue

Reforestation on NSB Kings Bay is required to reforest open land and understocked areas to obtain full productivity.

Goals, Objectives and Strategies

Table 4-10 shows the natural resources management goals, objectives, and strategies (Section 4.1) relevant to reforestation issue(s) and long-term management.

Table 4-10. Natural Resources Management Goals, Objectives, and Strategies Related to Reforestation.

Goals	Objectives	Strategies
1	1.2	NSB Kings Bay would maintain an ecosystem management awareness and training/education program available to all interested NSB Kings Bay personnel.
1	1.2	NSB Kings Bay would participate in regional stewardship/research programs that foster citizen participation in ecosystem education and stewardship.
2	2.2	NSB Kings Bay would continue to implement and update when necessary, the long-term management plan to protect and conserve the natural functions of wetlands and shoreline areas, including limiting wetland shoreline destruction and reducing adverse impacts to water quality.
2	2.2	NSB Kings Bay would evaluate its soil erosion control management program annually and will reduce the rate of soil erosion through the implementation and maintenance of long-term measures and projects.
3	3.1	Continue to establish and implement specific BMPs (GASWCC 2002; GFC 2009, SUBASE 2014) for the protection of water quality on all NSB Kings Bay (*e.g.*, wetlands, salt marsh and freshwater ponds) and surrounding water bodies (*e.g.*, Kings Bay and Cumberland Sound).

Table 4-10, continued.

Goals	Objectives	Strategies
3	3.2	NSB Kings Bay would implement programs and activities for the protection and enhancement of habitat for animal and plant species.
3	3.3	NSB Kings Bay would implement programs and activities for the enhancement of habitat for fish and game species.

Projects and Initiatives

Projects

Participation in the following projects will occur in support of the goals, objectives and strategies for reforestation:

- No. 1 (Invasive Plant Removal)
- No. 2 (Prescribed Burning to Support the Gopher Tortoise CCA)
- No. 3 (Pine Planting to Support the Gopher Tortoise CCA)
- No. 4 (Listed and Species-at-Risk Species Monitoring to Support Military Activities)
- No. 5 (Habitat Improvement Through Forest Management)
- No. 10 (Feral, Free-Ranging, and Invasive Animal Control)

Initiatives

NSB Kings Bay would, in consultation with foresters and wildlife biologists from NAVFAC SE, as well as Federal, state, and county wildlife biologists and foresters:

1. For program development, enlist the services of foresters, fish and wildlife biologists, and soil conservationists from NAVFAC SE, as well as Federal, state, and county wildlife biologists, foresters, and land managers.
2. Encourage participation by providing information about installation forest resources and communicating each individual's important contributions to ensuring a viable ecosystem. Use pamphlets, flyers, and command units to disseminate information.
    - Offer hands-on training and individual participation in activities to better demonstrate the concept, application, and importance of ecosystem management. Implement other activities such as landscaping (Section 4.3.1.5), wetland enhancement (Section 4.3.1.1), reforestation (Section 4.3.2.3), urban forestry (Section 4.3.1.4), and habitat improvements (Section 4.3.3.1).
3. NSB Kings Bay would consider participation and/or coordination of a regional multi-agency effort to develop a geographic information system (GIS) database to identify wetland types, soils, geologic characteristics, landscape positions, and functional assessment field scores

Because of the varying habitat requirements for most game species on NSB Kings Bay, the installation Natural Resources Manager and staff would identify areas for specific management in cooperation with the GDNR and USFWS.

Long-Term Management

Longleaf pine, within soil limitations, is the preferred tree species for forest regeneration, not only because it is a keystone species in one of the most biodiverse forest ecosystems, but also because originally, the region was almost entirely in longleaf pine, which has been cut and replaced with slash pine. In wetter soils not suitable for longleaf pine, and stands designated for commercial harvest, slash pine will be used for reforestation. In general, both pine communities, when properly managed, will support various populations of birds, amphibians and reptiles, and small and large mammals. Regeneration of hardwood areas would be accomplished by natural seeding or direct planting. Over the long-term, new stands will be managed according to the TSI and WHI practices described in Section 4.3.2.1, and the habitat enhancement methods described in Section 4.3.3.1. Long-term reforestation management practices are subject to change at the discretion of the NSB Kings Bay Natural Resources Manager. Changes in reforestation management practices may be implemented in response to changes in wildlife species, NSB Kings Bay military mission requirements, or Federal or state legal requirements.

Environmental Education/Stewardship

NSB Kings Bay would coordinate with the USDA Forest Service and GADNR to initiate activities to increase education and promote environmental stewardship. Long-term forest monitoring plots were established during the 2017 vegetation survey conducted by the GADNR. These plots will be surveyed every five years to assess long-term changes in forest and understory composition. Additional efforts are aimed at investigating ecosystem processes and functions within a complete watershed perspective.

Environmental Considerations During Management Practices

Reforestation controls long-term erosion and improves wildlife habitat. Reforestation with longleaf pine would promote the continuation of a desirable species (ecologically and economically) that has lost much of its original range due to development and the reforestation with slash pine monocultures.

Applicability of Other Management Issues

The following management issues, programs, and actions are directly or indirectly related to reforestation management, and will be consulted for additional management information or provided as additional training and education:

- Timber stand improvement, Section 4.3.2.1 – prescribed burns for site preparation.

- Using volunteer groups, including local Scout troops and interested base personnel, and offering hands-on training or individual participation to better demonstrate the concept, application, and importance of reforestation.
- SWPPP BMPs (SUBASE 2014) for stormwater runoff and soil conservation and erosion.

Climate Change

The same management considerations that would facilitate effective timber stand improvement in the face of climate change (see Section 4.3.2.1) would also be effective in ensuring the success of reforestation. Additional considerations specific to reforestation include:

- In addition to current conditions, consider long-term site and regional climatic conditions when planning a reforesting operation.
- Choose drought-resistant species if it becomes evident that southeastern Georgia is becoming prone to frequent drought. Techniques like using root gels or providing watering for newly planted seedlings during a dry summer can help improve survival.
- Avoid planting in a year that has severe drought predictions, or plant in the late summer when precipitation is more frequent.
- Remove or kill unwanted, invasive vegetation before planting tree seedlings or harvesting.
- Increase monitoring and control of invasive species to allow native understory to migrate naturally. Invasive species often gain a competitive advantage as habitat conditions change.

Ecosystem Management

Reforestation controls long-term erosion, minimizes stormwater runoff, and improves wildlife habitat; reforestation with longleaf pine would promote the continuation of a highly desirable species (ecologically and economically) that has been removed from much of its original range by human development and reforestation with slash pine monocultures.

Additional Sources of Information

Telephone Contact:

USDA Forest Service Region 8: (404) 347-4177

Internet Addresses:

Information on diseases and management measures:
http://www.freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/Our-Forests/Forest-Health/Forest-Health-Publications/Insects-and-Diseases/Principles-of-Control-Forest-Health

4.3.2.4 Forest Disease and Insect Protection

Forests within the state of Georgia are particularly susceptible to disease and insect infestation, largely because of varied terrain and forest types combined with dense forest cover. Fusiform rust impacts more acreage of Georgia forests than any other state in the nation with over 4,594,000 acres infected (http://willow.ncfes.umn.edu/fhh/fhh-99/Georgia_files/Georgia.htm) In addition, Georgia forests are susceptible to a wide array of insect pests indicated in Table 4-11.

Issue

Because of the regional susceptibility to insect pests and disease, NSB Kings Bay would need to implement appropriate forest protection measures to protect long-term health and sustainability of installation forest stands.

Goals, Objectives and Strategies

Table 4-11 indicates the natural resources management goals, objectives, and strategies (Section 4.1) relevant to forest disease and insect protection issue(s) and long-term management.

Table 4-11. Natural Resources Management Goals, Objectives, and Strategies Related to Forest Disease and Insect Protection.

Goals	Objectives	Strategies
2	2.1	NSB Kings Bay would continue to implement and update when necessary, the long-term management plan to protect and conserve the natural functions of wetlands and shoreline areas, including limiting wetland shoreline destruction and reducing adverse impacts to water quality.
2	2.3	NSB Kings Bay would review all proposed activities for impact avoidance to the attenuation capacity of the 100-year floodplain. If it is determined that development is necessary within the 100-year floodplain to support the military mission, development shall be first located in the previously disturbed areas of the floodplain.
3	3.1	Continue to establish and implement specific BMPs (GASWCC 2002; GFC 2009; SUBASE 2014) for the protection of water quality on all NSB Kings Bay (*e.g.*, wetlands, salt marsh and freshwater ponds) and surrounding water bodies (*e.g.*, Kings Bay and Cumberland Sound).
3	3.2	NSB Kings Bay would implement programs and activities for the protection and enhancement of all habitat for animal and plant species.
3	3.3	NSB Kings Bay would implement programs and activities for the enhancement of habitat for fish and game species.

Projects and Initiatives

Projects

Participation in the following projects will occur in support of the goals, objectives and strategies for forest disease and insect protection:

- No. 1 (Invasive Plant Removal)

- No. 2 (Prescribed Burning to Support the Gopher Tortoise CCA)
- No. 3 (Pine Planting to Support the Gopher Tortoise CCA)
- No. 5 (Habitat Improvement Through Forest Management)

Initiatives

1. NSB Kings Bay would periodically update the existing IPM plan to incorporate the most recent research on monitoring and forecasting methods and removal of exotic faunal pests on the installation. NSB Kings Bay will use education and research, as well as training, for on base land managers.
2. Continue to maintain environmental representation on the Facilities Review Board.
3. NSB Kings Bay would update the existing IPM plan to incorporate the most recent research on monitoring and forecasting methods and removal of exotic faunal pests on the installation. NSB Kings Bay will use education and research, as well as training, for on base land managers.
4. NSB Kings Bay would inventory current pesticide use and consult NAVFAC SE and the FDACS Pesticide Division for means of reduction.
5. Consult with foresters, fish and wildlife biologists, and soil conservationists from NAVFAC SE, as well as with Federal, state, and county wildlife biologists, foresters and land managers.
6. Consider non-pesticide removal methods, or removal using pesticides with lower toxicity applied at reduced rates.

Long-Term Management

It will be the on-going responsibility of the Installation Forester to implement preventive and corrective measures for the protection and sustainability of the NSB Kings Bay's forestry resources from disease and insect infestation. Preventive actions and/or indicators of diseases and insect problems known to occur in the region are provided below.

Disease Protection

Fusiform rust *(Cronartium quercuum* f. sp. *Fusiforme)*

Fusiform rust is the most damaging disease of slash and loblolly pines occurring throughout the southeastern U.S. The majority of infections occur prior to age five, eliminate the marketability of the tree, and/or cause its death before the tree reaches rotation age. Several environmental factors (climatic, edaphic, and biotic) and human activities significantly affect fusiform rust and other pathogens and the diseases they cause. Management practices (*e.g.*, timing and frequency of prescribed burning) can significantly influence fusiform rust infection (http://www.sfrc.ufl.edu/ Extension/bul903.htm). Factors such as weather conditions, individual tree resistance, site characteristics, and rust virulence all interact to influence infection levels. The risk of fusiform rust infection may be evaluated by assessing the critical factors indicated in Table 4-12.

Table 4-12. Estimating Fusiform Rust Hazard Risk.

Hazard or Risk	Susceptible Oaks	Rust in nearby pine stands	Soil Type	Site quality and growth rate
High	Abundant in and around plantation	<30% affected	Moderately to well drained	High-rapid growth
Moderate	Present in or around area but scattered and not abundant	20-30% infected	Poorly to moderately well drained	Moderate-rapid growth
Low	Lacking or few within 0.5 mile	<10% affected	Poorly drained flatwood spodosols	Low to slow growth

To prevent fusiform rust, when regenerating sites to pine, NSB Kings Bay foresters would:

- Use rust resistant seedlings available from state and privately owned nurseries. These seedlings have minimum susceptibility to the disease.
- Inspect seedlings for obvious stem swellings and cull infected seedlings prior to planting. Timed applications of fungicides to rust resistant seedlings should occur at the nursery. However, sometimes fungicides are not applied, and occasionally rust-infected seedlings will leave the nursery. Infected seedlings should be reported to the appropriate nursery officials immediately.
- Increase planting densities in high-hazard regions to allow for anticipated losses. This will also increase the number of thinnings required throughout the life of the stand, thus increasing costs. Increased planting densities – closer spacing of trees – cause a natural pruning of infected branches, thus reducing the chances that the rust will reach the trunk.
- Use site preparation techniques, such as prescribed burning, herbicides, and intensive mechanical preparation, that reduce the number of oak trees, unless this approach conflicts with other management objectives. Windrows containing large amounts of oak stumps and debris may provide ample sprouts that will later serve as alternate host material for future rust infections.
- Delay, when practical, fertilization until mid-rotation in order to prevent the rapid growth of young trees which increases their susceptibility to early-developing stem cankers. For example, delaying fertilization may be appropriate on soils that do not require early fertilization for seedling survival and early growth, or in management systems with longer, solid wood rotations.
- Evaluate tree plantations at ages three to five years to ascertain the amount of rust infection. Trees with trunk cankers will be salvaged by thinning, provided their removal does not open the stand more than is silviculturally-desirable.
- Use the following rule of thumb in planning the salvage of trees with trunk cankers: 1) less than 50 percent of circumference killed = more than an even chance of salvage for eight years; 2) 50 percent of circumference killed, but no bend in stem at canker or sunken canker face = an even chance of salvage for five years; 3) 50 percent of circumference killed, with a bend at canker and either a normal or sunken canker face = less than an even chance of salvage for five years.

Pitch Canker Fungus (*Fusiform moniliforme* var. *subglutinans*)

The pitch canker fungus can infect most of the southern pines, but more damage is done to slash pines. The canker gains entrance into trees through wounds, after which, the tips of terminal and lateral branches are often girdled and killed. Close examination of the dead shoots reveals that the wood is pitch soaked beneath the bark.

The pitch canker fungus has not posed a serious problem to pine plantations in Georgia. However, because the disease has the potential to outbreak sporadically, the Natural Resources Manager should be aware of its presence. In the event of a pitch canker outbreak, NSB Kings Bay would:

- Remove all infected trees during thinnings.
- Regenerate stands, utilizing the seed tree method with native seed sources that may be more disease resistant than nursery seedlings from a particular seed source.
- Avoid regenerating new plantations near existing diseased stands.
- Regulate stocking densities to avoid overcrowding and individual tree stress.
- Perform routine inspections of all planted pine stands.
- Coordinate with grounds maintenance to avoid exposing roots when mowing.

Insect Protection

Infestations of several insects, including the southern pine, Ips, and black turpentine beetles, occur in pines. Table 4-13 presents common insect pests occurring in Georgia. These beetles attack and may kill pine trees. The intensity of beetle attacks is dependent upon field conditions, tree vigor, and weather. Routine inspections by the NSB Kings Bay Natural Resources Manager will identify conditions consistent with infestation, including browning of needles.

Environmental Considerations During Management Practices

In the event that a disease or insect infestation occurs and encompasses a large enough area or number of trees, an even-aged harvest may be required. This will have potential impacts to wildlife habitats, and will potentially, temporarily, increase soil erosion, stormwater runoff and invasive species.

Table 4-13. Common Insects of Georgia Trees

Name	Host	Damage	Life History	Means of Recognizing Injury and Insects	Control
Southern Pine Beetles *(Dendroctonus fronlalis)*	Southern Pine	Trees killed by girdling of beetles and larvae. A fungus disease they carry into the tree can also cause death.	Occasionally epidemic. Beetles mainly active May through September. Beetles and larvae tunnel between bark. And wood. Overwinter mainly in larval and pupal stage in the bark.	Large areas of timber affected. Crown of tree yellow green to brown. Small, pitch tubes along the middle and upper trunk. S-shaped tunnels on inner bark of attacked trees. Beetle is blackish, 1/8" long, end of body rounded and smooth.	Cut and utilize infested trees; burn slabs. Fell and limb trees and expose to sunlight. Spray standing or felled trees with 6 Tbsps. of Lindane 20EC or 5 Tbsps. of Dursban 4E per gallon of water.
Black Turpentine Beetles *(Dendroctonus terebrans)*	Pine and Spruce	Trees attacked from soil line to 8' by adults and larvae. Occasionally large, healthy trees are killed.	Common in fresh stumps. Attack weakened trees. Occasionally kills large healthy trees if beetles are numerous. Adults and larvae tunnel out large patches between bark and wood.	Large tubes or pitch masses at base of trees. Crown of severely attacked trees turn yellow to brown. Common species black; others reddish brown. About 1/3" long.	If trees are killed, salvage as rapidly as possible; destroy slabs. Control by spraying with 6 Tbsps. of Lindane 20EC mixed with each gallon of water.
Pine Engraver Beetles *(Ips* spp.)	Southern Pine	Kills trees by girdling of beetles and larvae. Usually attack weakened trees.	Insect very common. Beetles active year round in warm weather. All life stages found in the inner bark.	Attacks patches rather than whole stand. Crowns turn yellow green to brown. May have pitch tubes on trunk. Vertical tunnels, beetles black or brown, length 1/8" to 1/4", rear end is scooped out, spired.	Good management; rapid utilization of trees severely affected by fire, disease or other agents. Control the same as for southern pine beetle.
Nantucket Pine Tip Moth *(Rhyacionia frustrana)*	Loblolly and Shortleaf Pine	Buds and shoots of small trees killed; trees stunted and deformed. Infestation is most severe under poor growing conditions.	Small larvae mine in terminal buds and twigs. From 2 to 4 generations a year. Adult moths emerge in March, June, July and September.	Ends of tree shoots die back 2 to 4 inches. Trees stunted and deformed. Larvae 1/2" long, yellowish; pupates in the twigs. Adult is a small moth. Trees over 15 feet tall are usually not attacked.	Control is usually not recommended under forest conditions. For yard or high value trees, use 4 tsps. of dimethoate (Cygon, De-Fend) 2EC per gallon of water. Treat in early spring when growth starts and repeat monthly as needed.

Source: The University of Georgia and the United States Department of Agriculture, http://www.forestry.uga.edu/efr/olddocs/docs/950.html

Applicability of Other Management Issues and NSB Kings Bay Programs

The following management areas are either directly or indirectly related to the implementation of TSI practices, and will be consulted for additional information:

- Timber and Wildlife Stand Improvement Activities, Section 4.3.2.1 - additional timber stand activities to reduce or minimize stand susceptibility.
- SWPPP to include BMPs for stormwater runoff, soil conservation and erosion if eradication of diseases and pests requires clear cutting areas.
- Use volunteer groups, including local Scout troops, and interested installation personnel to offer hands on training or individual participation to better demonstrate the appropriateness of reforestation.

Climate Change

The same management considerations that would facilitate effective timber stand improvement in the face of climate change (see Section 4.3.2.1) would also be effective in mitigating against forest disease and insects. Some specific considerations include:

- Manage for a healthy density. Keep trees vigorous to better resist pests and survive in the face of disturbances. Thinning for timber stand improvement reduces stress and keeps forests at reasonable densities for a mix of species and age classes.
- Diversify species. When planting, consider species likely to be successful even if the range of species is expected to change over time with climate change.
- Choose drought-resistant species if it becomes evident that southeastern Georgia is becoming prone to frequent drought. Techniques like using root gels or providing watering for newly planted seedlings during a dry summer can help improve survival.
- Increase monitoring and control of invasive species to allow native understory to migrate naturally. Invasive species often gain a competitive advantage as habitat conditions change.
- Diversify stand ages and structure. Stands of different age classes and species composition will not all be susceptible to the same damage. Thinning, harvesting, and planting all provide opportunities to create diversity.
- Monitor for disease and insects. A small problem is easier and less expensive to control.
- Control invasive vines. Vines can completely overgrow trees and shade out their canopy and the mass of vines in canopies increases risk of damage from wind.

Ecosystem Management

Protection of existing forest stands and reforestation of diseased or insect infested stands increases overall vigor and quality of the resource. In addition, this will increase the habitat quality within these stands, minimize erosion and reduce potential sedimentation into surrounding water bodies.

Laws, Executive Orders, Regulations, Directives, and Memoranda Relevant to Wildlife Damage and Disease

Forest Pest Suppression Memorandum of Agreement between the Department of Agriculture and DoD, 11 December 1990, is the planning, coordination, and execution of field operations to prevent and suppress damaging forest insects and disease outbreaks.

Additional Sources of Information

Telephone Contacts:

Georgia State Office – USDA NRCS: (706) 546-2272

Georgia Forestry Commission: (912) 576-5387

Technical Reports/Publications:

Managing Wildlife, Alabama Wildlife Federation, 1999.

Pitch Canker Video: Provides an overview of the problem in California; 16 minutes. Can be obtained on loan from the US Forest Service Video Library by calling 1-800-683-8366 and asking for *Pine Pitch Canker - A Threat to California's Forests*. The video currently can be viewed at the Pacific Grove Museum of Natural History, 165 Forest Ave, Pacific Grove, CA.

Internet Addresses:

Wildlife damage and diseases information provided by the University of Nebraska Cooperative Extension Service, Great Plains Agricultural Council, and the USDA:
http://icwdm.org/handbook/allPDF/complete%20Handbook.pdf

Nuisance Wildlife Control Information:
https://www.aphis.usda.gov/aphis/home/

Fusiform rust information provided by the University of Florida, School of Forest Resources and Conservation
http://sfrc.ufl.edu/extension/4h/foresthealth/diseases/fusirust.html

4.3.3 Fish and Wildlife

Fish and wildlife management actions are designed to conserve, enhance, and regulate habitat for game and non-game indigenous wildlife species. This section addresses the following: 1) habitat enhancement and management for terrestrial wildlife and migratory bird species, 2) protection and management of rare, threatened and endangered species, 3) management of game species, 4) prevention and control of wildlife damage and disease, and 5) fisheries management.

Historically, management actions have focused on individual species, rather than groups of species, and incorporated local habitat restoration and enhancement. More recently, conservation efforts have been attempting to restore species populations, vegetative communities, and regional habitats at the ecosystem level. Therefore, to most effectively manage the threatened and endangered and game species discussed herein, NSB Kings Bay has identified conservation priorities for the

installation that address endemic species and habitats. The conservation priorities identified herein include both terrestrial (*e.g.*, gopher tortoise, wood stork and least tern) and aquatic wildlife species (*e.g.*, manatees, sea turtles, whales), as well as native vegetative communities located on or immediately adjacent to NSB Kings Bay that have particular conservation importance and urgency due to their rarity, imperilment, and/or the public interest.

4.3.3.1 Habitat Enhancement

Habitat enhancement involves the implementation of general management practices to manipulate fish and wildlife habitat to change existing wildlife populations.

Issue

Growth and development on and surrounding the installation would require the implementation of many management practices to conserve and enhance terrestrial and aquatic wildlife populations on NSB Kings Bay and in the region.

Goals, Objectives and Strategies

Table 4-14 shows the natural resources management goals, objectives, and strategies (Section 4.1) related to habitat enhancement issue(s) and long-term management.

Table 4-14. Natural Resources Management Goals, Objectives, and Strategies Related to Habitat Enhancement.

Goals	Objectives	Strategies
1	1.2	NSB Kings Bay would maintain an ecosystem management awareness and training/education program available to all interested NSB Kings Bay personnel.
1	1.2	NSB Kings Bay would participate in regional stewardship/research programs that foster citizen participation in ecosystem education and stewardship.
2	2.2	NSB Kings Bay would continue to implement and update when necessary, the long-term management plan to protect and conserve the natural functions of wetlands and shoreline areas, including limiting wetland shoreline destruction and reducing adverse impacts to water quality.
2	2.4	NSB Kings Bay would increase the number of natural areas on the installation as opportunities arise and would utilize native species for new landscaping.
3	3.1	Continue to implement specific BMPs (GASWCC 2002; GFC 2009; SUBASE 2014) for the protection of water quality on all NSB Kings Bay (*e.g.*, wetlands, salt marsh and freshwater ponds) and surrounding water bodies (*e.g.*, Kings Bay and Cumberland Sound).
3	3.2	NSB Kings Bay would implement programs and activities for the protection and enhancement of all habitat for animal and plant species.

Table 4-14, continued.

Goals	Objectives	Strategies
4	4.1	NSB Kings Bay would continue the recreation planning board that addresses means for providing recreational activities. Membership on the recreation board would consist of, at a minimum, the Natural Resources Manager, a member of the Facilities Review Board and the Director of MWR. NSB Kings Bay would also consider utilizing a National Park Service (NPS) representative to review the findings of the analysis.

Projects and Initiatives

Projects

Participation in all of the projects will occur in support of the goals, objectives and strategies for habitat enhancement:

- No. 1 (Invasive Plant Removal)
- No. 2 (Prescribed Burning to Support the Gopher Tortoise CCA)
- No. 3 (Pine Planting to Support the Gopher Tortoise CCA)
- No. 4 (Listed and Species-at-Risk Species Monitoring to Support Military Activities)
- No. 5 (Habitat Improvement Through Forest Management)
- No. 6 (Shortnose and Atlantic Sturgeon Abundance and Distribution Monitoring)
- No. 7 (INRMP Review and Revision)
- No. 8 (Manatee Population Monitoring)
- No. 9 (Shoreline and Riparian Conservation)
- No. 10 (Feral, Free-Ranging, and Invasive Animal Control)

Initiatives

1. For program development, enlist the services of foresters, fish and wildlife biologists, and soil conservationists from NAVFAC SE, as well as Federal, state, and county wildlife biologists, foresters, and land managers.
2. Encourage participation by providing information about installation natural resources and communicating each individual's important contributions to ensuring a viable ecosystem. Use pamphlets, flyers, and command units to disseminate information.
3. Offer hands-on training and individual participation in activities to better demonstrate the concept, application, and importance of ecosystem management. Management activities such as landscaping (Section 4.3.1.5), wetland enhancement (Section 4.3.1.1), reforestation (Section 4.3.2.3) and urban forestry (Section 4.3.1.4) are suitable for training and active participation.
4. NSB Kings Bay would consider participation and/or coordination of a regional multi-agency effort to develop a geographic information system (GIS) database to identify wetland types, soils, geologic characteristics, landscape positions, and functional assessment field scores
5. Continue to implement the BMPs spelled out in the SWPPP (SUBASE 2014), the *Field Manual for Erosion and Sediment Control in Georgia* (GASWCC 2002), and *Georgia's*

Best Management Practices for Forestry (GFC 2009) to control erosion, sedimentation, and stormwater runoff.

6. Conduct surveys utilizing one or more of the following:
   - Contract a private firm;
   - Develop a team of experts from within the DoN with sufficient technical knowledge to conduct the surveys;
   - Utilize existing installation personnel with knowledge to complete the surveys; or
   - Pursue services provided for in cooperative agreements between NSB Kings Bay and the USFWS, the GDNR, and/or TNC.
7. Continue to maintain environmental representation on the Facilities Review Board.
8. Consult with foresters, fish and wildlife biologists, and soil conservationists from NAVFAC SE, as well as with Federal, state, and county wildlife biologists, foresters, and land managers.
9. Perform objectives identified within the *Landscape Master Plan* (Section 2.5.4):
   - Utilize volunteer groups and/or interested installation personnel to assist in plantings.
   - Increase the use of endemic plant species throughout the installation.
   - Selection of endemic plant species will be accomplished in consultation with the GNHP and the Georgia Native Plant Society.
   - Increase coordination of mowing requirements to coincide with seasonal wildlife requirements.
   - Increase utilization of green waste as mulch and wildflower plantings and landscape activities surrounding existing water bodies.
   - Increase the number of natural areas on the golf course to reduce grounds maintenance costs, herbicide and pesticide use and increase wildlife habitats, while increasing the overall aesthetic qualities of the golf course.
10. Use volunteers for construction of habitat enhancement projects.
11. NSB Kings Bay would institute wildlife education and stewardship programs.
12. NSB Kings Bay would assist the Eastern Painted Bunting Working Group of Partners in Flight

Long-Term Management

Wildlife habitats would be managed to sustain and enhance fish and wildlife resources on the installation consistent with the military mission. Presented below are long-term management concepts and protective measures that apply to terrestrial wildlife habitats, both regionally and on NSB Kings Bay. Management practices for the protection and enhancement of aquatic species are discussed later in this INRMP.

NSB Kings Bay would sustain and enhance terrestrial wildlife habitats using various combinations of the following management concepts. These management concepts would be implemented at the discretion of the Natural Resources Manager.

Terrestrial Wildlife Management

- Preserve and regenerate mast-producing hardwoods (*e.g.*, acorns, hickory, nuts, and pecans, as well as various berries) during TSI and WHI (Section 4.3.2.1) activities on the installation.
- Avoid habitat fragmentation and similar land uses that divide large, continuous areas into small, isolated tracts separated by inhospitable habitat conditions that may constrain wildlife movement.
- Maintain forest stands for different sizes, ages, and densities. Where possible, allow prescribed burns to encroach into power line rights-of-way to benefit wintering Henslow's sparrows.
- Utilize tree thinnings in coordination with prescribed burns in managed timber stands to remove dense overstory and understory, remove forest litter to decrease wildfire susceptibility, and increase forage availability.
- Continue a nesting assistance program throughout NSB Kings Bay. This effort involves retaining snags (dead trees) within managed forests for use by woodpeckers, owls, squirrels, bluebirds, and other cavity dwelling species; installation of artificial nesting platforms for wood storks and osprey. In addition to these areas within managed forests, NSB Kings Bay natural resources personnel would provide nest boxes where natural cavities are infrequent.
- Coordinate maintenance (*e.g.*, mowing, pruning, trimming) with seasonal wildlife needs within improved, semi-improved, and unimproved areas (see Section 4.3.1.4).
- Maintain native vegetation in various successional stages along wooded edges to provide food, cover, and access to adjacent wood lots.
- Create brush piles within clear cuts and other open areas to provide cover, nesting, and feeding areas for wildlife.
- Establish hedgerow plantings in open fields planted with perennials for wildlife foraging. When possible, these will be located to provide travel corridors between more wooded habitat fragments.
- Establish designated wildlife areas where appropriate throughout the installation.
- Maintain food plots at appropriate locations to attract wildlife.

Migratory Bird Management

Migratory birds are protected under the Migratory Bird Treaty Act (MBTA) of 1918 (16 USC 703-711), which decreed that all migratory birds and their parts (*e.g.*, eggs, nests and feathers) are fully protected by law. Current MBTA regulations authorize permits for direct take of migratory birds for activities such as scientific research, education, and depredation control. However, the MBTA does not expressly address the issuance of permits for incidental take, so the Navy is compelled to exercise due diligence for activities requiring NEPA analysis and must develop appropriate and reasonable conservation measures to avoid, minimize, and mitigate identified significant adverse effects to migratory birds and their nests resulting from such activities.

Migratory birds at NSB Kings Bay are protected under the MBTA against "takings" for normal and routine operations such as installation support functions. Under the MBTA, takings could include pesticide application, nest or egg removal, and occasionally, tree removal. However, habitat modification as a result of timber sales does not constitute a take; neither does nest removal outside nesting season. At NSB Kings Bay, before any routine installation support action is taken that may affect any migratory bird species, the Natural Resources Manager would be informed. The Natural Resources Manager would determine if the possible impacts associated with the routine action would impact migratory bird species and, if necessary, would initiate discussions or negotiate a permit with the USFWS.

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. The Natural Resource Manager will therefore ensure that migratory bird surveys are regularly completed on NSB Kings Bay. 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). The Natural Resource Manager and Regional Natural Resources support staff will use collected data to avoid, minimize, and mitigate impacts to migratory birds resulting from activities on NSB Kings Bay. Because most migratory birds cross installation and state boundaries, data sharing is a vital component to their management. Data collected at NSB Kings Bay 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). Public outreach opportunities, such as Christmas Bird Counts and wildlife viewing opportunities will continue to be promoted on the installation.

Migratory birds, especially night-migrating species, would be protected from the harmful effects of communication towers (*i.e.*, radio, television, cellular and microwave). Consideration would be given to monitoring beneath, and retrofitting if needed, the existing radio tower to eliminate the potential harm to migrating bird species. Furthermore, any future siting or construction of towers at NSB Kings Bay would be in accordance with the USFWS *Guidance on the Siting, Construction, Operation and Decommissioning of Communication Towers.* The IPM plan would also be utilized to reduce pesticide use on NSB Kings Bay to benefit migratory birds.

Climate Change

In addition to focusing on ecosystem function and biodiversity, habitat restoration efforts need to increasingly address the impacts of climate change. For example, returning a stream or forest

plot to healthy function may not mean recreating what it was like in the past, but anticipating how to meet the needs of wildlife and humans in a climate-changed future. This task is made especially challenging by the high level of uncertainty about how the climate will change and how society will respond.

The one certainty at NSB Kings Bay is that sea level will continue to rise resulting in more saltwater intrusion to nearshore soils and freshwater wetlands. Periods of unusually high precipitation and long severe droughts are likely to become more frequent, as are tropical storm events. Although precise long-term predictions about their frequency and intensity is not likely.

Areas that are at most risk to climate change impacts should be prioritized for restoration. For example, at NSB Kings Bay, the estuarine-terrestrial transition zone would be of high priority since it is most susceptible to salt water intrusion and most critical to buffering the installation from storm surge and other flooding.

Plants should be selected for habitat restoration based upon one or a combination of three key traits: likelihood to survive extreme events, resilience to weather disturbances, and support of wildlife.

Trait 1. Plants Likely to Survive Extreme Events

- Drought-tolerant species have a higher probability of surviving the hot Georgia climate in the face of increasingly variable precipitation.
- Salt-tolerant species have a higher probability of surviving hypersaline conditions caused by drought and coastal flooding.

Trait 2. Plants Resilient to Weather Disturbances

- Rhizomatous plants help to prevent erosion and biological invasion, and increase the likelihood of post-disturbance recruitment of native vegetation.
- Plants with wind-dispersed seeds increase the likelihood of post-disturbance recruitment of native vegetation, which prevents biological invasion and future erosion, particularly after tropical storm events.
- Plants with tidally-dispersed seeds increase likelihood of post-flood recruitment of native vegetation, which also helps prevent biological invasion as well as coastal and bank erosion.

Trait 3. Plants that Support Wildlife

- Plants with wildlife-dispersed seeds support wildlife with fruit and seed sources for consumption and increases the likelihood of post-disturbance recruitment of native vegetation, which prevents biological invasion
- Tall dense vegetation provides refugia during marsh flooding caused by sea-level rise and more frequent and severe storms.

- Insectary plants support diverse invertebrate assemblages and provide pollination services.

4.3.3.2 Threatened and Endangered Species

The Endangered Species Act (ESA) prohibits Federal agencies from authorizing, funding, or carrying out any actions that destroy or adversely modify "critical habitat." The Georgia Endangered Wildlife Act of 1973 and the Wildflower Preservation Act of 1973 provide state protection to rare plants and animals that may or may not be recognized for protection under the ESA.

Issue

Federal- and state-listed species that occur on NSB Kings Bay have been identified as conservation priorities and require special protection efforts.

Goals, Objectives and Strategies

Table 4-15 shows the natural resources management goals, objectives, and strategies (Section 4.1) relevant to threatened and endangered species issue(s) and long-term management.

Table 4-15. Natural Resources Management Goals, Objectives, and Strategies Related to Threatened and Endangered Species.

Goals	Objectives	Strategies
2	2.1	NSB Kings Bay has a number of pests and exotic species (*e.g.*, fire ants, mole crickets, aphids, and mosquitoes) that occur on the installation and the control of these pests and exotics is an integral ecosystem management practice on NSB Kings Bay.
2	2.1	NSB Kings Bay would continue to monitor the health and populations of game and non-game species to ensure that wildlife do not become a nuisance to the installation or to the surrounding region.
2	2.2	NSB Kings Bay would continue to implement and update when necessary, the long-term management plan to protect and conserve the natural functions of wetlands and shoreline areas, including limiting wetland shoreline destruction and reducing adverse impacts to water quality.
2	2.2	NSB Kings Bay would periodically evaluate its stormwater management program and activities contributing to stormwater runoff and/or pollutant loading in stormwater runoff.
2	2.2	NSB Kings Bay would evaluate its soil erosion control management program annually and would reduce the rate of soil erosion through the implementation and maintenance of long-term measures and projects.
2	2.2	NSB Kings Bay would inventory the use of pesticides and fertilizers on NSB Kings Bay. NSB Kings Bay would continue to assess alternatives to and a reduction in pesticide and fertilizer use. The intent is to reduce chemical pesticide and fertilizer use to help protect water quality.
2	2.3	NSB Kings Bay would review all proposed activities for impact avoidance to the attenuation capacity of the 100-year floodplain. If it is determined that development is necessary within the 100-year floodplain to support the military mission, development shall be first located in the previously disturbed areas of the floodplain.

Table 4-15, continued.

2	2.4	NSB Kings Bay would increase the number of natural areas on the installation as opportunities arise and would utilize native species for new landscaping.
2	2.5	NSB Kings Bay would continue to implement existing policies to minimize adverse impacts to ecosystem resources from land disturbance activities (*e.g.*, clearing, training).
3	3.1	Continue existing timber stand and wildlife habitat improvement practices using prescribed burns and thinnings to achieve individual stand objectives, including the enhancement of habitat, maximizing sustained yield, enhancing multiple use management, reducing the potential for wildfires, and controlling diseases and insect pests.
3	3.1	Continue to establish and implement specific BMPs (GASWCC 2002; GFC 2009; SUBASE 2014) for the protection of water quality on all NSB Kings Bay (*e.g.*, wetlands, salt marsh and freshwater ponds) and surrounding water bodies (*e.g.*, Kings Bay and Cumberland Sound.
3	3.2	NSB Kings Bay would continue to update surveys for Neotropical Migratory Bird and Rare, Threatened, and Endangered Species.

Projects and Initiatives

Projects

Participation in the following projects will occur in support of the goals, objectives and strategies for threatened and endangered species:

- No. 1 (Invasive Plant Removal)
- No. 2 (Prescribed Burning to Support the Gopher Tortoise CCA)
- No. 3 (Pine Planting to Support the Gopher Tortoise CCA)
- No. 4 (Listed and Species-at-Risk Species Monitoring to Support Military Activities)
- No. 5 (Habitat Improvement Through Forest Management)
- No. 6 (Shortnose and Atlantic Sturgeon Abundance and Distribution Monitoring)
- No. 7 (INRMP Review and Revision)
- No. 8 (Manatee Population Monitoring)
- No. 9 (Shoreline and Riparian Conservation)
- No. 10 (Feral, Free-Ranging, and Invasive Animal Control)

Initiatives

1. Continue to maintain environmental representation on the Facilities Review Board.
2. NSB Kings Bay would consider participation and/or coordination of a regional multi-agency effort to develop a geographic information system (GIS) database to identify wetland types, soils, geologic characteristics, landscape positions, and functional assessment field scores.
3. Conduct surveys utilizing one or more of the following:
    - Contract a private firm;

- Develop a team of experts from within the DoN with sufficient technical knowledge to conduct the surveys;
- Utilize existing installation personnel with knowledge to complete the surveys; or
- Pursue services provided for in cooperative agreements between NSB Kings Bay and the USFWS, the GDNR and/or TNC.

4. Consult with foresters, fish and wildlife biologists, and soil conservationists from NAVFAC SE, as well as with Federal, state, and county wildlife biologists, foresters, and land managers.
5. Continue to implement the BMPs spelled out in the SWPPP (SUBASE 2014), the *Field Manual for Erosion and Sediment Control in Georgia* (GASWCC 2002), and *Georgia's Best Management Practices for Forestry* (GFC 2009) to control erosion, sedimentation, and stormwater runoff.
6. Increase the use of endemic plant species throughout the installation.
   - Selection of endemic plant species would be accomplished in consultation with the GNHP and the Georgia Native Plant Society.
7. Increase coordination of mowing schedule to coincide with seasonal wildlife requirements.
8. It would be the primary responsibility of the Natural Resources staff representative to the Facilities Review Board to ensure the use of site selection and site plan development criteria to minimize impacts to the installation's environmental and ecological resources.
9. Utilize natural resources GIS as a tool for identifying and minimizing impacts.
10. Use volunteers for construction of habitat enhancement projects.

Long-Term Management

NSB Kings Bay would actively manage areas for the species listed below, but would also manage for other Federally or state-listed threatened or endangered species as conditions warrant. NSB Kings Bay has identified several listed threatened or endangered species as conservation priorities (Table 4-16). Although these species were not identified as conservation priorities, NSB Kings Bay would continue to provide protection and habitat conservation to the bald eagle (a frequent winter visitor) and the American alligator. Presently, no special management considerations would be implemented; however, monitoring of American alligators would continue to ensure that they do not become a nuisance species (see Section 4.3.3.3). Changes in management practices may result from: 1) the listing of a new species for protective status or the removal of a species; or 2) a change in species occurrence status on NSB Kings Bay. NSB Kings Bay would continue to conduct species surveys to identify new species and monitor changes in species populations and habitat on the installation. Species information provided by the surveys would be used to modify management practices. Management practices would be modified by the Natural Resources Manager in consultation with NAVFAC SE foresters and fish and wildlife biologists, as well as other Federal and state agencies.

Table 4-16. INRMP Management Activities and Projects That Benefit Rare, Threatened, and Endangered Species Potentially Occurring on NSB Kings Bay

Species (in alphabetical order by common name)	Status	Category	Cross-reference to text	Management Activities that Benefit the Species and its Habitat														INRMP Projects that Benefit the Species and its Habitat									
				Wetlands Management	Soil Conservation and Erosion Control	Stormwater and Water Quality Control	Landscaping, Grounds Maint, and Urban Forestry	Floodplain Management	Integrated Pest Management	Timber Stand Improvement	Land Treatment Area Forests	Reforestation	Forest Disease and Insect Protection	Habitat Enhancement for Fish and Wildlife	Threatened and Endangered Species Protection	Game Wildlife Management	Prevent & Control Wildlife Damage & Disease	Outdoor Recreation	Invasive Plant Removal	Prescribed Burning to Support the GT CCA	Pine Planting to Support the GT CCA	Listed and SAR Species Monitoring to Support Mission Activities	Habitat Improvement Through Forest Mgmt.	Shortnose and Atlantic Sturgeon Monitoring	INRMP Review and Update	Manatee Population Monitoring	Shoreline and Riparian Conservation	Feral, Free-Ranging, and Invasive Animal Control
Atlantic Sturgeon (*Acipenser oxyrhynchus*)	FE	Anadromous Fish	Table 3-9 pp.3-8, 4-82, 6-15	M	M	M	M	M						M	M			M				P		P	P		P	
Ball Moss (*Tillandsia recurvate*)	N	Plant on Tree Limbs	Table 3-7, Fig 3-4 p. 4-92	M	M	M	M	M	M				M	M	M		M		P			P			P			P
Bartram's Air Plant (*Tillandsia bartramii*)	N	Plant on Tree Limbs	Table 3-7, Fig 3-4 p. 4-92	M	M	M	M	M	M				M	M	M		M		P			P			P			P
Eastern Diamondback (*Crotalus adamanteus*)	FC	Uplands Snake	Table 3-5 p. 4-82	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	P	P	P	P	P		P			P
Eastern Indigo Snake (Drymarchon couperi)	FT, ST	Uplands Snake	pp. 3-2, 4-83	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	P	P	P	P	P		P			P
Giant Manta Ray (*Manta birostris*)	FT	Coastal pelagic fish	Table 3-9 pp. 3-8, 4-83	M	M	M		M						M	M			M				P		P	P		P	
Gopher Frog (*Lithobates capito*)	FP, SR	Upland Burrower	pp. 3-2, 4-83	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	P	P	P	P	P		P			P
Gopher Tortoise (*Gopherus polyphemus*)	FC, ST	Upland Burrower	Tab 3-5, 3-8, Fig 3-4 pp. 2-8, 4-84, 6-5,7-5	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	P	P	P	P	P		P			P
Green Sea Turtle (*Chelonia mydas*)	FT, ST	Coastal, Nests on Beaches	Table 3-9 pp. 4-86, 7-15	M	M	M	M	M	M					M	M			M	P			P			P		P	P
Green-fly Orchid (*Epidendrum conopseum*)	SU	Plant on Rocks and Tree Limbs	Table 3-7, Fig 3-4 p. 4-93	M	M	M	M	M	M				M	M	M		M		P			P			P			P
Hawksbill Sea Turtle (*Eremochelys imbricate*)	FE, SE	Coastal Turtle	Table 3-9 pp. 4-86, 7-16	M	M	M	M	M	M					M	M			M	P			P			P		P	P
Hooded Pitcher Plant (*Sarracenia minor*)	SU	Wetland Plant	Table 3-7, Fig 3-4 pp. 2-7, 4-93	M	M	M	M	M	M	M	M		M	M	M		M	M	P	P	P	P			P			P
Kemp's Ridley Sea Turtle (*Lepidochelys kempi*)	FE, SE	Coastal Turtle	Table 3-9 pp. 4-86, 7-16	M	M	M	M	M	M					M	M			M	P			P			P		P	P
Least Tern (*Sterna antillarum*)	SR	Coastal Bird	Table 3-8, Fig 3-4 pp. 4-93, 7-7	M	M	M	M	M	M					M	M			M	P			P			P		P	P
Leatherback Sea Turtle (*Dermochelys coriacea*)	FE, SE	Coastal, Nests on Beaches	Table 3-9 p. 4-86, 7-16	M	M	M	M	M	M					M	M			M	P			P			P		P	P
Loggerhead Sea Turtle (*Caretta caretta*)	FT, SE	Coastal, Nests on Beaches	Table 3-9 pp. 3-24, 4-86, 7-15	M	M	M	M	M	M					M	M			M	P			P			P		P	P
Monarch Butterfly (*Danaus plexippus*)	FP	Migratory Butterfly	p. 4-85	M	M	M	M	M	M				M	M	M		M		P			P	P		P			P
North Atlantic Right Whale (*Eubalena glacialis*)	FE, SE	Usually Oceanic	Table 3-9 pp. 1-8, 5-2, 4-85	M	M	M	M	M							M			M							P		P	

Species (in alphabetical order by common name)	Status	Category	Cross-reference to text	Management Activities that Benefit the Species and its Habitat															INRMP Projects that Benefit the Species and its Habitat									
				Wetlands Management	Soil Conservation and Erosion Control	Stormwater and Water Quality Control	Landscaping, Grounds Maint, and Urban Forestry	Floodplain Management	Integrated Pest Management	Timber Stand Improvement	Land Treatment Area Forests	Reforestation	Forest Disease and Insect Protection	Habitat Enhancement for Fish and Wildlife	Threatened and Endangered Species Protection	Game Wildlife Management	Prevent & Control Wildlife Damage & Disease	Outdoor Recreation	Invasive Plant Removal	Prescribed Burning to Support the GT CCA	Pine Planting to Support the GT CCA	Listed and SAR Species Monitoring to Support Mission Activities	Habitat Improvement Through Forest Mgmt.	Shortnose and Atlantic Sturgeon Monitoring	INRMP Review and Update	Manatee Population Monitoring	Shoreline and Riparian Conservation	Feral, Free-Ranging, and Invasive Animal Control
Painted Bunting (*Passerina ciris*)	N	Bird in Scrub and Hammocks	Table 3-4 pp. 2-9, 4-36, 4-94	M	M	M	M	M	M	M	M		M	M	M	M	M	M	P	P	P	P	P		P		P	P
Pond Spice (*Litsea aestivalis*)	SR	Wetland Plant	Table 3-7, Fig 3-4 pp. 2-7, 4-95	M	M	M	M	M	M	M	M		M	M	M		M		P			P			P			P
Red Knot (*Calidris canutus* ssp. *rufa*)	FT, SR	Coastal Bird	pp. 3-6, 4-86	M	M	M	M	M	M					M	M			M	P			P			P		P	P
Sherman's Fox Squirrel (*Sciurus niger shermanii*)	N	Arboreal Mammal	Table 3-8	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	P	P	P	P			P			P
Shortnose Sturgeon (*Acipenser brevirostrum*)	FE, SE	Anadromous Fish	Table 3-9 pp.3-8, 4-89, 6-15	M	M	M	M	M						M	M			M				P		P	P		P	
Smalltooth Sawfish (*Pristis pectinata*)	FE	Coastal Shark	Table 3-9 pp. 3-8, 4-88	M	M	M	M	M						M	M			M				P			P		P	
Southern Hog-nosed Snake (*Heterodon simus*)	FP, ST	Uplands Snake	pp. 3-2, 4-89	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	P	P	P	P	P		P			P
Spotted Turtle (*Clemmys guttata*)	FP	Uplands Snake	pp. 3-3, 4-89	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	P	P	P	P	P		P		P	P
Striped Newt (*Notophthlamus perstriatus*)	FC, ST	Wetland Amphibian	pp. 3-6, 4-90	M	M	M	M	M	M	M	M		M	M	M	M	M	M	P	P	P	P			P		P	P
Tiny-leaf Buckthorn (*Sageretia miniutiflora)*	N	Wetland Plant	Table 3-7, Fig 3-4 pp. 4-95	M	M	M	M	M	M	M	M		M	M	M		M		P			P			P			P
West Indian Manatee (*Tricheus manatus latirostris*)	FT, SE	Coastal Migrant	App. D, Table 3-9 pp. 2-9, 4-90, 6-18	M	M	M	M	M						M	M			M	P			P			P	P	P	
Wood Stork (*Mycteria Americana*)	FT, SE	Wetland and Forest Bird	Tables 3-4, Fig 3-4 pp. 2-9, 3-8, 4-91	M	M	M	M	M	M	M	M		M	M	M		M	M	P			P			P		P	P

M = The denoted management activity benefits the denoted species and its habitat.

P = The denoted project benefits the denoted species and its habitat.

Status Key:

FC = Federal Candidate; FE = Federally Endangered; FP = Federally Petitioned; FT = Federally Threatened, N = Not Listed

SE = State Endangered, ST = State Threatened, SR = State Rare, SU = State Unusual

Federally Threatened and Endangered Species

Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)

Status: Endangered (Federal)

Adult Atlantic sturgeon primarily reside in marine waters, but migrate up rivers in late spring to spawn. A second spawning run may occur in autumn. Spawning occurs between the salt front and fall line. Larvae move down river after hatching and juveniles settle out in brackish estuarine waters where they may reside for months or years. Subadults move into nearshore coastal waters and adults may make migrations of more than 1,000 miles before returning to their natal rivers to spawn. Atlantic sturgeon utilize the waterways adjacent to NSB Kings Bay as juveniles, and NSB Kings Bay would coordinate with the NMFS on any Atlantic sturgeon issues. This INRMP protects habitat for Atlantic sturgeon by managing water quality through factors such as wetlands (Section 4.3.1.1), soil erosion (Section 4.3.1.2), stormwater control (Section 4.3.1.3), and floodplains (Section 4.3.1.5). Projects described in this INRMP that benefit and conserve the Atlantic sturgeon and its habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Shortnose and Atlantic Sturgeon Monitoring, INRMP Review and Update, and Shoreline and Riparian Conservation (see Chapter 6 for descriptions).

Eastern Diamondback Rattlesnake (*Crotalus adamanteus*)

Status: Petitioned Species (Federal)

Eastern diamondback rattlesnakes are present on NSB Kings Bay. They generally live in dry pine flatwoods, sandy woodlands, and scrub habitats, and often inhabit gopher tortoise burrows. Natural resources managers at NSB Kings Bay actively manage habitat for the benefit of gopher tortoises and these actions concurrently protect habitat for eastern diamondback rattlesnakes. Although the Eastern diamondback rattlesnake is not endangered, indiscriminate killing and widespread loss of habitat have decreased numbers throughout its range, which stretches from North Carolina to eastern Louisiana. This INRMP protects habitat for eastern diamondback rattlesnakes through active management of factors such as grounds maintenance (Section 4.3.1.4), thinnings (Section 4.3.2.1), and reforestation (Section 4.3.2.3). Projects described in this INRMP that benefit and conserve the eastern diamondback rattlesnake and its habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Invasive Plant Removal, Prescribed Burning to Support the Gopher Tortoise CCA, Pine Planting to Support the Gopher Tortoise CCA, Habitat Improvement Through Forest Management, INRMP Review and Update, and Feral, Free-Ranging, and Invasive Animal Control (see Chapter 6 for descriptions).

Eastern Indigo Snake (*Drymarchon couperi*)

Status: Threatened (Federal and State)

Eastern indigo snakes are elusive and were not confirmed on NSB Kings Bay for many years until one was sighted on the outskirts of the solar energy field in spring 2016. The installation provides ample suitable habitat, such as in dry pine flatwoods, sandy woodlands, and scrub habitats. Management activities directed at gopher tortoises on NSB Kings Bay will also benefit Eastern indigo snakes. This INRMP protects habitat for Eastern indigo snakes through active management of factors such as grounds maintenance (Section 4.3.1.4), thinnings (Section 4.3.2.1), and reforestation (Section 4.3.2.3). Projects described in this INRMP that benefit and conserve the Eastern indigo snake and its habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Invasive Plant Removal, Prescribed Burning to Support the Gopher Tortoise CCA, Pine Planting to Support the Gopher Tortoise CCA, Habitat Improvement Through Forest Management, INRMP Review and Update, and Feral, Free-Ranging, and Invasive Animal Control (see Chapter 6 for descriptions).

Giant Manta Ray (*Manta birostris*)

Status: Threatened (Federal)

The giant manta ray has a worldwide distribution in tropical and temperate climates. It spends most of its time in offshore waters, but occasionally ventures into coastal waters, where it may come within the vicinity of NSB Kings Bay, although the likelihood is low. Projects described in this INRMP that benefit and conserve the giant manta ray and its habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Shortnose and Atlantic Sturgeon Monitoring, INRMP Review and Update, Manatee Population Monitoring, and Shoreline and Riparian Conservation (see Chapter 6 for descriptions).

Gopher Frog (*Lithobates capito*)

Status: Petitioned (Federal)

Gopher frogs prefer upland sandy uplands in pine-forest areas, and historically were ubiquitous in longleaf pine habitat. They are often associated with gopher tortoise burrows, which they use for shelter. Forest management strategies such as thinning and prescribed burning help open canopy and promote the growth of forage plants. Gopher frogs are vulnerable to predation by nuisance animals such as dogs, feral cats, and raccoons, and destruction and alteration of wetlands used for breeding. This INRMP protects habitat for gopher frogs through active management of factors such as wetlands (Section 4.3.1.1), grounds maintenance (Section 4.3.1.4), thinnings (Section 4.3.2.1), reforestation (Section 4.3.2.3), and Habitat Enhancement (Section 4.3.3.1). Projects

described in this INRMP that benefit and conserve gopher frog habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Invasive Plant Removal, Prescribed Burning to Support the Gopher Tortoise CCA, Pine Planting to Support the Gopher Tortoise CCA, Habitat Improvement Through Forest Management, INRMP Review and Update, and Feral, Free-Ranging, and Invasive Animal Control (see Chapter 6 for descriptions).

Gopher Tortoise (*Gopherus polyphemus*)

Status: Candidate (Federal) and Threatened (State)

Gopher tortoises prefer areas of well-drained sandy soils with abundant herbaceous groundcover. Suitable habitat for the gopher tortoise is limited on NSB Kings Bay due to its low elevation, high water table, and dense pine plantations. A 2008 gopher tortoise survey conducted by the University of Georgia on NSB Kings Bay found a total of 378 burrows, primarily within ruderal habitats adjacent to young pine forest (53% of all burrows observed). The survey conservatively estimated a population of 128 resident gopher tortoises on NSB Kings Bay, primarily concentrated in the Northwest section, Etowah Park, and Cherry Point.

Primary management practices for the gopher tortoise would include prescribed growing-season burns within pine stands every two-to-three years (Sections 4.3.2.1 and 4.3.3.2). Additionally, these areas would be seeded with legumes and other herbaceous plants that are part of the gopher tortoises' diet. This INRMP further protects habitat for gopher tortoises through active management of factors such as grounds maintenance (Section 4.3.1.4), thinnings (Section 4.3.2.1), and reforestation (Section 4.3.2.3). Proper management of this species would also benefit the Eastern indigo snake (*Drymarchon corais couperi*), which is often found in conjunction with the gopher tortoise. Land disturbance activities within a known gopher tortoise habitat would require mitigation or relocation in accordance with the recommendations outlined in the Gopher Tortoise Candidate Conservation Agreement. Although there is suitable unoccupied gopher tortoise habitat at NSB Kings Bay, current Navy guidance would prohibit the relocation of gopher tortoises from off-base locations to NSB Kings Bay. Projects described in this INRMP that benefit and conserve the gopher tortoise and its habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Invasive Plant Removal, Prescribed Burning to Support the Gopher Tortoise CCA, Pine Planting to Support the Gopher Tortoise CCA, Habitat Improvement Through Forest Management, INRMP Review and Update, and Feral, Free-Ranging, and Invasive Animal Control (see Chapter 6 for descriptions).

Monarch Butterfly (*Danaus plexippus plexippus*)

Status: Petitioned (Federal)

The monarch butterfly is found throughout the United States during warm months, but migrates to Mexico during winter. Monarch caterpillars exclusively eat milkweed leaves, making presence of milkweed (*Asclepias* spp.) 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 wetlands (Section 4.3.1.1), landscaping and grounds maintenance (Section 4.3.1.4), Integrated Pest Management (Section 4.3.1.6), and Habitat Enhancement (Section 4.3.3.1). Projects described in this INRMP that benefit and conserve monarch butterfly habitat include the Invasive Plant Removal, Listed and Species-at-Risk Species Monitoring to Support Military Activities, Habitat Improvement Through Forest Management, INRMP Review and Update, and Feral, Free-Ranging, and Invasive Animal Control (see Chapter 6 for descriptions).

North Atlantic Right Whale (*Eubalaena glacialis*)

Status: Endangered (Federal and State)

The North Atlantic right whale is one of the world's most endangered whales and is designated as the Georgia State Marine Mammal. Population estimates indicate the total number of remaining animals at no more than 300 to 350 (Southeastern Right Whale Implementation Team 2000). Additionally, it appears that the eastern North Atlantic population is nearly extinct while the western North Atlantic population totals approximately 300 individuals. There has been no sign of recovery during the past 15 years, and because the species is long-lived, extinction may not occur immediately but biological extinction could occur in the near future (NMFS 2005). The NMFS has designated three North Atlantic right whale critical habitats along the east coast of the U.S.: Cape Cod Bay, the Great South Channel, and the waters off the coast of Georgia and Florida from the Altamaha Sound, Georgia, to Sebastian Inlet, Florida (NOAA and NMFS 1991). Because of their importance as seasonal feeding and nursery areas, these locations are critical to the survival of the North Atlantic right whale. As designated critical habitat, these areas must be managed to permit the recovery of the North Atlantic right whale to a sustainable level for the foreseeable future.

Threats to the North Atlantic right whale population include collisions with ships, entanglement in fishing nets, and habitat degradation by vessels. NSB Kings Bay and the Tenant Commands, such as SUBGRP 10, in cooperation with the DoN Regional Environmental Office of Commander Navy Region Southeast, local port authorities, harbor pilot associations, and applicable state agencies, have taken an active role with the Right Whale Recovery Southeast Implementation

Team to form an early warning communication network. NSB Kings Bay is cooperating with the Navy Research Lab (NRL) to identify the acoustic signatures of North Atlantic right whales, and SUBGRP 10 has produced its own Right Whale Initiatives. These Initiatives include a North Atlantic right whale training seminar for submarine navigators, harbor pilots, and navigational team personnel, and educational brochures and pamphlets to all submarine commands. Furthermore, SUBGRP 10 participates in an early warning network, which initiated the development of a standard operating procedure for Operational Control Center (OPCON) to chart and distribute information concerning North Atlantic right whale sightings by daily aerial survey teams. The protocols for vessel and submarine operation in North Atlantic right whale habitats are outlined in the Section 7 Consultation Biological Opinion (BO) from NMFS dated May 15, 1997.

This INRMP protects habitat for North Atlantic right whales by managing water quality through factors such as wetlands (Section 4.3.1.1), soil erosion (Section 4.3.1.2), stormwater control (Section 4.3.1.3), and floodplains (Section 4.3.1.5). Projects described in this INRMP that benefit and conserve the North Atlantic right whale and its habitat include the INRMP Review and Update and Shoreline and Riparian Conservation (see Chapter 6 for descriptions).

Red Knot (*Calidris canutus* spp. *rufa*)

Status: Threatened (Federal) and Rare (State)

The red knot migrates between South America and Canada from April to October, passing over the Atlantic seaboard of the United States. Red knots primarily utilize tidal flats and beaches during their migrations, which presents the possibility for them to occur at or near these habitats on NSB Kings Bay, although they have never been identified on the installation. This INRMP protects habitat for red knots through active management of factors such as wetlands (Section 4.3.1.1), erosion control (Section 4.3.1.2), stormwater control (Section 4.3.1.3), and floodplains (Section 4.3.1.5). Projects described in this INRMP that benefit and conserve the red knot and its habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Invasive Plant Removal, INRMP Review and Update, Shoreline and Riparian Conservation, and Feral, Free-Ranging, and Invasive Animal Control (see Chapter 6 for descriptions).

Sea Turtles

Status: Loggerhead and Green Sea Turtles are Federally-Threatened, but Loggerheads are State-Endangered and Green Sea Turtles are State-Threatened; All others are Endangered (Federal and State)

Several sea turtle species occur in waters adjacent to NSB Kings Bay, including the loggerhead turtle (*Caretta caretta),* green sea turtle *(Chelodia mydas),* leatherback sea turtle

(Dermochelys cariaceq), hawksbill sea turtle *(Eretmochelys imbricata)*, and Kemp's Ridley sea turtle *(Lepidochelys kempii)*. Cumberland Island National Seashore provides 20 percent of known Georgia nesting sites for the loggerhead sea turtle and also serves as a nesting site for the leatherback sea turtle. Green sea turtles have been known to feed on algae growing on docks and other structures on NSB Kings Bay, and juvenile green sea turtles have been known to migrate upstream into estuaries to forage in late summer and early fall. Sub-adult Ridley's sea turtles are highly migratory and range from Florida to Nova Scotia, feeding on invertebrates and crustaceans.

This INRMP protects habitat for sea turtles by managing water quality through factors such as wetlands (Section 4.3.1.1), soil erosion (Section 4.3.1.2), stormwater control (Section 4.3.1.3), and floodplains (Section 4.3.1.5). Projects described in this INRMP that benefit and conserve sea turtles and their habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Invasive Plant Removal, INRMP Review and Update, Shoreline and Riparian Conservation, and Feral, Free-Ranging, and Invasive Animal Control (see Chapter 6 for descriptions).

A study documenting the inter-nesting habitat use, migratory pathways, and post-nesting movements of nesting loggerhead sea turtles was started in 2004. Twelve loggerhead sea turtles were captured and tagged in 2004 on Cumberland, Jekyll, and Sapelo Islands. Turtles were then tracked from May 2004 to January 2005. Of the 12 turtles tagged, 10 provided data during the inter-nesting period. The majority of the nesting turtles had high site fidelity, used less than 15 miles of coastline, and remained close to shore. Several turtles used inshore waters exclusively. Only one of the tagged turtles' home range overlapped the Kings Bay Submarine Channel.

Each of these sea turtle species is especially prone to collisions with boat propellers, entanglement in fishing nets and lobster lines, poaching, and loss of habitat due to human activities (*e.g.*, development, vehicles, and bright lights). Dredging activities are also hazardous to several sea turtle species. NSB Kings Bay contracts with the USACE to establish submarine channels for NSB Kings Bay. The USACE dredge operations in the Southeast must adhere to the South Atlantic Regional Biological Opinion (SARBO) for sea turtles. During these dredging activities, USACE coordinates with NSB Kings Bay and other environmental organizations and conservation groups to provide the following as written in the *Final Report on Mitigation of Dredge Related Impacts to Sea Turtles*:

- Schedule dredging operations during periods of low sea turtle occurrence. Construction dredging with a hopper dredge in St. Marys entrance would be performed from late fall to early spring.
- Utilize turtle spotters to identify turtles during dredging activities.
- Require dredge contractors to provide a turtle protection plan in their overall environmental protection plans. Sea turtle plans would be subject to review by necessary

installation personnel as well as experts in the field of sea turtle impact mitigation/ecology.

- Prepare contingency plans with the assistance of the USACE Jacksonville District to remove sea turtles by trawl if any of the following occur. 1) parts of any endangered or threatened turtle species are observed during the dredge operation, 2) three dead sea turtles are observed within any seven-day period, 3) five dead sea turtles are observed during the dredging and/or within 10 miles of the dredging site.
- Perform sea turtle assessments in conjunction with various experts in the field of sea turtle ecology (*e.g.*, GDNR, USFWS, and/or Cumberland Island National Seashore).
- Use dredges fitted with California-style dragheads.
- Minimize lighting on all dredge and waterfront operations during turtle nesting season.

Shortnose Sturgeon (*Acipenser brevirostrum)*

Status: Endangered (Federal and State)

The shortnose sturgeon is the smallest species of sturgeon (family Acipenseridae), rarely exceeding 3.5 feet in length and 14 pounds in weight. It has a short, conical snout with four barbels in front of its large subterminal mouth. The shortnose sturgeon's life history is complex. Much of its spawning behavior and early life stages are still not fully understood. The shortnose sturgeon is anadromous, migrating from salt water to spawn in freshwater. Unlike most fish species, spawning is not a yearly event for most shortnose sturgeon. Males spawn every other year and females every third year. Females lay between 40,000-200,000 eggs which hatch in approximately 13 days. Newly-hatched fry are poor swimmers and drift with the currents along the bottom. As they grow and mature, the fish move downriver into the most brackish parts of estuarine systems. NSB Kings Bay would coordinate with the NMFS on any shortnose sturgeon issues. This INRMP protects habitat for shortnose sturgeon by managing water quality through factors such as wetlands (Section 4.3.1.1), soil erosion (Section 4.3.1.2), stormwater control (Section 4.3.1.3), and floodplains (Section 4.3.1.5). Projects described in this INRMP that benefit and conserve the shortnose sturgeon and its habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Shortnose and Atlantic Sturgeon Monitoring, INRMP Review and Update, and Shoreline and Riparian Conservation (see Chapter 6 for descriptions).

Smalltooth Sawfish (*Pristis pectinata)*

Status: Endangered (Federal)

The waters around NSB Kings Bay are within the historical range of the smalltooth sawfish, but only one specimen has been captured as far north as Georgia since 2002, and it was caught offshore at a depth greater than 45 m (NMFS 2009). Ideal habitats for juveniles are shallow-water mangrove lagoons, which do not exist on the Georgia coast. It is possible, however, that adult sawfish

may transit and forage in the waters adjacent to NSB Kings Bay. This INRMP protects habitat for smalltooth sawfish by managing water quality through factors such as wetlands (Section 4.3.1.1), soil erosion (Section 4.3.1.2), stormwater control (Section 4.3.1.3), and floodplains (Section 4.3.1.5). Projects described in this INRMP that benefit and conserve the smalltooth sawfish and its habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, INRMP Review and Update, and Shoreline and Riparian Conservation (see Chapter 6 for descriptions).

Southern Hog-nosed Snake (*Heterodon simus*)

Status: Petitioned (Federal) and Threatened (State)

Southern hog-nosed snakes 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. This INRMP protects habitat for southern hog-nosed snakes through active management of factors such as grounds maintenance (Section 4.3.1.4), thinnings (Section 4.3.2.1), reforestation (Section 4.3.2.3), and Habitat Enhancement (Section 4.3.3.1). Projects described in this INRMP that benefit and conserve southern hog-nosed snake habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Invasive Plant Removal, Prescribed Burning to Support the Gopher Tortoise CCA, Pine Planting to Support the Gopher Tortoise CCA, Habitat Improvement Through Forest Management, INRMP Review and Update, and Feral, Free-Ranging, and Invasive Animal Control (see Chapter 6 for descriptions).

Spotted Turtle (*Clemmys guttata*)

Status: Petitioned (Federal)

The spotted turtle 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 and degradation of wetland habitats are the principal threats to the species. This INRMP protects habitat for spotted turtles through active management of factors such as wetlands (Section 4.3.1.1), soil erosion (Section 4.3.1.2), landscaping and grounds maintenance (Section 4.3.1.4), and floodplains management (Section 4.3.1.5). Projects described in this INRMP that benefit and conserve spotted turtle habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Invasive Plant Removal, Prescribed Burning to Support the Gopher Tortoise CCA, Pine Planting to Support the Gopher Tortoise CCA, Habitat Improvement Through Forest Management, INRMP Review and Update, Shoreline and Riparian Conservation, and Feral, Free-Ranging, and Invasive Animal Control (see Chapter 6 for descriptions).

Striped Newt (*Notophthalmus perstriatus*)

Status: Candidate (Federal) and Threatened (State)

The striped newt has not been found on NSB Kings Bay. It attains a maximum length of about 4 inches and is olive-green to dark brown with a yellow belly and a red stripe running the length of the side of its trunk and extending onto the head and tail where it may become fragmented. There may also be a row of red spots along the side of its body and a faint stripe down the center of its back. The striped newt occupies longleaf pine-dominated savanna, scrub, and sandhills with a rich groundcover of grasses maintained by frequent fire. Adults and juveniles live underground in the uplands. Adults move to small ephemeral ponds near the uplands to breed from late fall through early spring. Eggs are laid in the ponds and larvae reside there until metamorphosis into the eft stage. Efts are orange-red with the characteristic red stripe and primarily reside in longleaf pine-wiregrass forests. This INRMP protects habitat and water quality for striped newts through active management of factors such as wetlands (Section 4.3.1.1), soil erosion (Section 4.3.1.2), thinnings (Section 4.3.2.1), and reforestation (Section 4.3.2.3). Projects described in this INRMP that benefit and conserve the striped newt and its habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Invasive Plant Removal, Prescribed Burning to Support the Gopher Tortoise CCA, Pine Planting to Support the Gopher Tortoise CCA, INRMP Review and Update, Shoreline and Riparian Conservation, and Feral, Free-Ranging, and Invasive Animal Control (see Chapter 6 for descriptions).

West Indian Manatee (*Trichechus manatus latirostris*)

Status: Threatened (Federal and State)

Manatees located in NSB Kings Bay waters would be protected in accordance with NSB Kings Bay Instruction 11015.5E and written *Standard Manatee Conditions and Procedures for Aquatic Construction* (see Appendix D: Manatee Protection). Manatees are most frequently sighted in NSB Kings Bay waters and in rivers, estuaries, bays, creeks, and canals along the coast of Georgia from the beginning of April to the end of November. Specific threats to manatee populations are related to collisions with marine vessels. To minimize these threats, the DoN through a Section 7 consultation with the USFWS prepared a *Manatee Protection Plan*. Protective measures identified within this plan include: 1) retrofitting all applicable vessels with manatee guards; 2) implementing bay-wide speed limits; 3) eliminating freshwater sources; 4) establishing a formal Manatee Watch Program to report manatee sightings; and 5) attendance at manatee awareness, avoidance training, and boater education courses by harbor boat operators. In addition, all manatee sightings are reported to NSB Kings Bay Port Operations along with the time, number, size, location, direction of movement,

and description of tag, if present. GDNR Wildlife Resources Division, Wildlife Conservation Section would continue researching manatee habitats and migratory patterns, and would assist NSB Kings Bay with any other manatee issues (*e.g.*, injured or stranded animals). This INRMP protects habitat for manatees by managing water quality through factors such as wetlands (Section 4.3.1.1), soil erosion (Section 4.3.1.2), stormwater control (Section 4.3.1.3), and floodplains (Section 4.3.1.5). Projects described in this INRMP that benefit and conserve the manatee and its habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Invasive Plant Removal, INRMP Review and Update, Manatee Population Monitoring, and Shoreline and Riparian Conservation (see Chapter 6 for descriptions).

Wood Stork (*Mycteria americana*)

Status: Threatened (Federal and State)

Wood storks are large, colonial wading birds that feed and nest in fresh and brackish open-water habitats, such as salt marshes, ponds, ditches, and mangrove and cypress swamps. These birds nest in colonies in woody vegetation over standing water, which provides protection for eggs. The primary threat to this species is loss of habitat (*i.e.*, feeding and nesting sites). Wood stork management practices on NSB Kings Bay would continue to focus on creation of feeding and nesting habitat throughout the installation by preserving wetlands (Section 4.3.1.1), promoting native vegetation in drainage canals, and, where necessary, constructing Wood Stork rookery platforms.

NSB Kings Bay attempted to construct a wood stork rookery and continues to conserve and enhance wood stork habitat throughout the installation. The rookery consists of 100 8-to-10-foot-tall nesting platforms installed in shallow water, but has never been as effective as a spoil drainage area on the lower base. Proper water-level management is crucial at rookeries to stimulate nesting activity and prevent predators from destroying nests. Constructed wood stork platforms are presently located in Etowah Pond. Nesting activity at these locations has yet to be observed. NSB Kings Bay would consider wetland vegetation control in this area to promote additional habitat use. NSB Kings Bay also established the Pagan Creek salt marsh mitigation project, which was modified to add a series of bermed terraces to hold small fish and other wood stork food items as the tide ebbs, providing high quality forage at any stage of the tide, but a superior forage area was created at the P636 wetland mitigation site. This INRMP further protects habitat for wood storks through active management of factors such as wetlands (Section 4.3.1.1), soil erosion (Section 4.3.1.2), stormwater control (Section 4.3.1.3), and floodplains (Section 4.3.1.5). Projects described in this INRMP that benefit and conserve the wood stork and its habitat include the Listed and Species-at-Risk Species Monitoring to Support

Military Activities, Invasive Plant Removal, INRMP Review and Update, Shoreline and Riparian Conservation, and Feral, Free-Ranging, and Invasive Animal Control (see Chapter 6 for descriptions).

NSB Kings Bay would consult governmental agencies as well as conservation groups for additional advice about habitat requirements if necessary. This INRMP provides a list of written, internet, and telephone sources for potential consultation (*e.g.*, Harris Neck National Wildlife Refuge and the Waterbird Society).

State-listed Species and Species of Concern

Ball moss (*Tillandsia recurvata*)

Status: None

Ball moss is an epiphyte typically found on live oak (*Quercus virginiana*). At NSB Kings Bay, the species is located in the maritime forest community where the canopy of live oaks and other species provide protection. Any disturbance that would result in destruction of its host, or opening up of the canopy, would be detrimental to this species. This INRMP protects habitat for ball moss through active management of factors such as soil conservation (Section 4.3.1.2) and forest disease protection (Section 4.3.2.4). Projects described in this INRMP that benefit and conserve ball moss and its habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Invasive Plant Removal, INRMP Review and Update, and Feral, Free-Ranging, and Invasive Animal Control (see Chapter 6 for descriptions).

Bartram's Air Plant (*Tillandsia bartramii*)

Status: None

Bartram air plant is an epiphyte typically located on limbs of live oak, red cedar, and other trees in bay swamps, tidal swamp forests, and maritime forests. At NSB Kings Bay, the species is located on live oak within humid maritime forests. Bartram air plant requires only partial sun. Any disturbance that would result in destruction of its host or opening up of the canopy would be detrimental to this species. This INRMP protects habitat for Bartram air plant through active management of factors such as soil conservation (Section 4.3.1.2) and forest disease protection (Section 4.3.2.4). Projects described in this INRMP that benefit and conserve Bartram air plant and its habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Invasive Plant Removal, INRMP Review and Update, and Feral, Free-Ranging, and Invasive Animal Control (see Chapter 6 for descriptions).

Green-fly orchid (*Epidendrum conopseum*)

Status: Unusual (State)

The green-fly orchid is an epiphyte typically found on live oak and magnolia. At NSB Kings Bay, it was observed in the maritime forest community and the mixed hardwood drained community. Activities such as prescribed fire, clear-cutting, or selective timber harvest would likely be detrimental to this species and will not be completed in areas where it occurs. This INRMP protects habitat for green-fly orchids through active management of factors such as soil conservation (Section 4.3.1.2) and forest disease protection (Section 4.3.2.4). Projects described in this INRMP that benefit and conserve the green-fly orchid and its habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Invasive Plant Removal, INRMP Review and Update, and Feral, Free-Ranging, and Invasive Animal Control (see Chapter 6 for descriptions). Populations should be closely monitored.

Hooded Pitcher Plant (*Sarracenia minor*)

Status: Unusual (State)

The hooded pitcher plant is a heliophytic, perennial herb and is a component of a fire-dependent community with poorly drained acidic soils. At NSB Kings Bay, this species was observed at wetland margins in pine flatwoods. In the absence of fire, succession results in encroachment of a variety of woody plants. This INRMP protects habitat for hooded pitcher plants through active management of factors such as wetland management (Section 4.3.1.1), soil conservation (Section 4.3.1.2), and stand improvement (prescribed burns, clear-cutting; Section 4.3.2.1). Projects described in this INRMP that benefit and conserve the hooded pitcher plant and its habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Invasive Plant Removal, Prescribed Burning to Support the Gopher Tortoise CCA, Pine Planting to Support the Gopher Tortoise CCA, INRMP Review and Update, and Feral, Free-Ranging, and Invasive Animal Control (see Chapter 6 for descriptions). Populations should be closely monitored.

Least Tern (*Sterna antillarum*)

Status: Rare (State)

The least tern is a shorebird that prefers nesting on sandy beaches with pebbles and similar sized shells and short, sparse vegetation. The primary threat to least terns is human encroachment resulting in loss of habitat. On NSB Kings Bay, least terns nest in a 10-acre dredge spoil site located on the southeastern side of the installation, and in a 25-acre site created for least terns in Crab Island.

NSB Kings Bay would continue to implement protective measures for least terns within dredge spoil areas. This INRMP protects habitat for least terns through active management of factors

such as wetlands (Section 4.3.1.1), stormwater control (Section 4.3.1.3), and floodplains (Section 4.3.1.5). NSB Kings Bay will consult with the USACE to determine additional habitat improvement techniques that would not impact the military mission of the Installation. Projects described in this INRMP that benefit and conserve the least tern and its habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Invasive Plant Removal, INRMP Review and Update, Shoreline and Riparian Conservation, and Feral, Free-Ranging, and Invasive Animal Control (see Chapter 6 for descriptions).

Painted Bunting (*Passerina ciris*)

Status: None

Limited data are currently available regarding this neotropical migrant's habitat preferences and beneficial management practices. Painted buntings prefer coastal scrub-shrub wetland areas; however, they have also been located in managed pine forests and grassy habitats adjacent to wetland areas. Nests are usually built low in shrubs or successional scrub habitats. Specific threats to the painted bunting are associated with the loss and severe fragmentation of Eastern forests, breeding habitat alteration, and nest parasitism by the brown-headed cowbird. NSB Kings Bay management practices would continue to include planting wax myrtles around fishery resources (Section 4.3.1.4) and coordinating with the United States Geological Survey (USGS) in mapping optimal habitat for painted buntings on the installation. In addition, the Natural Resources staff would coordinate with grounds maintenance and landscaping to modify standard drainage ditch and pond bank maintenance to minimize the loss of wax myrtle. Staff would minimize maintenance disturbance to nesting bird species by scheduling these activities during non-nesting season. Additional monitoring is necessary to determine the abundance and distribution of painted buntings on NSB Kings Bay. This INRMP protects habitat for painted buntings through active management of factors such as wetlands (Section 4.3.1.1), landscaping (Section 4.3.1.4), and stand improvement (prescribed burns and thinnings; Section 4.3.2.1). Projects described in this INRMP that benefit and conserve the painted bunting and its habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Invasive Plant Removal, Prescribed Burning to Support the Gopher Tortoise CCA, Pine Planting to Support the Gopher Tortoise CCA, Threatened and Endangered Species Habitat Improvement, INRMP Review and Update, Shoreline and Riparian Conservation, and Feral, Free-Ranging, and Invasive Animal Control (see Chapter 6 for descriptions).

Pond Spice (*Litsea aestivilis*)

Status: Rare (State)

Pond spice is a deciduous shrub located within bay heads, pocosins, and edges of sandy sinkholes and ponds where it occurs on wet, sandy, acidic or peaty soils (Patrick et al. 1995). At NSB Kings Bay, the species is primarily located in the northwestern section and adjacent to the North River. Drainage, or other activities that alter soil moisture content, will be avoided in this plant's habitat. This INRMP protects habitat for pond spice through active management of factors such as soil conservation (Section 4.3.1.2), stand improvement (prescribed burns, clear-cutting; Section 4.3.2.1), and forest disease protection (Section 4.3.2.4). Projects described in this INRMP that benefit and conserve pond spice and its habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Invasive Plant Removal, INRMP Review and Update, and Feral, Free-Ranging, and Invasive Animal Control (see Chapter 6 for descriptions). Populations will be monitored for vigor, sex ratio, fruit production, and seedling recruitment.

Tiny-leaf Buckthorn (*Sageretia miniutiflora*)

Status: None

Tiny-leaf buckthorn is a thorny shrub located within shell middens and hammocks over calcareous soils. At NSB Kings Bay, the species is located on two historical sites absent specific management practices. Even-aged harvesting or other kinds of severe disturbance, such as site preparation and conversion to pine plantation, would be detrimental to the species and will not be completed in areas where it occurs. This INRMP protects habitat for tiny-leaf buckthorn through active management of factors such as soil conservation (Section 4.3.1.2), landscaping (Section 4.3.1.4), and forest disease protection (Section 4.3.2.4). Projects described in this INRMP that benefit and conserve tiny-leaf buckthorn and its habitat include the Listed and Species-at-Risk Species Monitoring to Support Military Activities, Invasive Plant Removal, INRMP Review and Update, and Feral, Free-Ranging, and Invasive Animal Control (see Chapter 6 for descriptions). Populations will be monitored for vigor, sex ratio, fruit production, and seedling recruitment.

Environmental Considerations During Management Practices

During the implementation of activities to enhance habitat potential for both general species and installation conservation priorities, short-term loss of habitat may occur, and increased erosion and sedimentation may occur potentially impacting installation and surrounding water bodies.

Climate Change

Climate change places many species of wildlife at ever increasing risk. It affects migrants, such as birds and large mammals, as well as species that cannot migrate due to highly localized

habitat requirements, such as residing in a particular wetland or river basin. Many migratory species time their arrival in a particular area to coincide with prey availability or vegetative production. Mild winters and warm springs, for example, can cause plants to fruit and seed earlier than normal, providing less forage for migratory birds that, for generations, arrived later in the season to take advantage of peak food source.

There are three primary ways in which climate change can affect wildlife:

- Direct weather impacts include events such as rising temperature, drought, flooding, excessive rainfall, and tropical storm events.
- Collateral habitat damage can result from the above-mentioned weather events and can result in long-term changes, and even complete destruction, of a habitat. Storm surge from a tropical storm can alter the salinity regime of a coastal wetland. Drought can increase the chance of a destructive wildfire or alter plant species composition.
- Indirect threats may include the above-mentioned asynchrony of a bird migration with available food sources, as well as food chain effects related to impacts of aquatic prey on fisheries.

Under a normal, gradual rate of climate change, most species have time to adapt, are able to compensate for differences in temperature and weather patterns, and rebound from an infrequent weather events. The recent increase in the rate of climate change, and the increasing frequency of droughts, floods, and storm surge, however, may outpace the adaptive abilities of many species. Some species are more vulnerable to these threats than others. This would include those with specialized habitat requirements and those with relatively slow reproductive cycles. A climate change vulnerability assessment would help managers at NSB Kings Bay to prioritize species and habitats for which urgent adaptive management options should be implemented.

Applicability of Other Management Issues on NSB Kings Bay Programs

The following management issues and programs are directly or indirectly related to habitat management for installation conservation priorities and other wildlife species.

- TSI and WSI, Section 4.3.2.1 – use of TSI and WSI to enhance wildlife habitat.
- Wetlands, Section 4.3.1.1 – buffers around wetlands.
- Stormwater, Section 4.3.1.3 – BMPs
- Grounds Maintenance and Landscaping, Section 4.3.1.4 – seasonal mowing and use of native species.

- Using volunteer groups including local Scout troops and interested base personnel, and offering hands-on training or individual participation to better demonstrate the concepts application and importance of wildlife and habitat enhancement.

Laws, Executive Orders, Regulations, Directives, and Memoranda Relevant to Threatened and Endangered Species Management

Endangered Species Act, 16 USC 1531-1543 , Title 50 Code of Federal Regulations (CFR) Part 17, provides for the identification and protection of threatened and endangered species of fish, wildlife, and plants and their critical habitats. Requires Federal agencies to ensure that no agency action is likely to jeopardize the continued existence of a threatened or endangered species.

Migratory Bird Treaty Act, as amended 16 USC 703-712, prohibits the taking or harming of a migratory bird, its eggs, nests, or young without the appropriate permit.

Sikes Act, as amended 16 USC 670 a-o, requires each military department to manage fish and wildlife resources in accordance with a tripartite cooperative plan agreed to by the USFWS and state wildlife agency, to provide its personnel with professional training in fish and wildlife management.

Marine Mammal Protection Act of 1972, 16 USC 1361-1407, prohibits the taking or harming of marine mammals without the appropriate permit.

Fish and Wildlife Conservation Act, 16 USC 2901, encourages all Federal departments and agencies to utilize their statutory and administrative authority, to the maximum extent practicable and consistent with each agency's statutory responsibilities, to conserve and promote conservation of nongame fish and wildlife and their habitats.

EO 13112, 3 February 1999, requires executive agencies to restrict the introduction of exotic organisms into natural ecosystems.

OPNAV M-5090.1D, 12-3.5 discusses laws that govern natural resources management relating to the protection and management of fish and wildlife resources.

Additional Sources of Information

Habitat Enhancement

Books:

Woodworking for Wildlife, Homes for Birds & Mammals, prepared by Non-game Wildlife Section, Minnesota Department of Natural Resources (1-800-657-3757)

Managing Wildlife, Alabama Wildlife Federation, 1999.

Telephone Contacts:

The Wildlife Society: (301) 897-9770

USDA NRCS, Georgia State Office: (706) 546-2272

Internet Sites

Effects of Fire on Threatened and Endangered Plants:
https://www.fws.gov/fire/ifcc/esr/Library/TEPlants.pdf

Fire Effects on Plants and Wildlife:
https://www.feis-crs.org/feis/

Prevention and Control of Wildlife Damage and Wildlife Diseases:
http://icwdm.org/handbook/allPDF/complete%20Handbook.pdf

Threatened and Endangered Species

Books:

Final Recovery Plan for the Northern Right Whale, US Department of Commerce, NOAA and NMFS, December 1991.

Cumberland Island National Seashore General Management Plan, US Department of the Interior, National Park Service, January 1984.

Final Report on Review of Existing Information for Mitigation of Dredge-Related Impacts to Sea Turtles Naval Submarine Base Kings Bay, Georgia, Alvarez, Lehman and Associates, April 1985.

Telephone Contacts:

The Wildlife Society: (301) 897-9770

USDA NRCS, Georgia State Office: (706) 546-2272

GDNR, Wildlife Resources Division: (770) 918-6411

The Nature Conservancy Georgia Office: (407) 873-6946

Internet Addresses:

US Fish and Wildlife Service, Conservation in Georgia
https://www.fws.gov/southeast/georgia/

Georgia Department of Natural Resources
https://gadnr.org/

4.3.3.3 Game Management

Game management is also covered under the three party cooperative agreement between the Navy, the State of Georgia, and the USFWS. Hunting is allowed in designated areas of the installation. NSB Kings Bay hunting regulations (SUBASEINST 11015.1T) are reviewed annually, by the Natural Resource Manager and Game Warden. All hunting activities are conducted in accordance with Georgia state and U.S. federal laws and regulations. These laws are enforced on the Installation by a Federally trained game warden.

Game management in the context of this plan includes established techniques, which benefit a variety of wildlife including both game and non-game species. Many neo-tropical migratory birds (*e.g.*, flycatchers, painted buntings, summer tanagers), small mammals, and gopher tortoises receive

direct benefits from the techniques traditionally considered game management (*e.g.*, food plot development and prescribed burns). Although this section describes game management, it specifically includes several species of non-game wildlife having similar ecological requirements.

Issue

NSB Kings Bay would utilize effective management and monitoring techniques to sustain essential habitat and populations of game species (*e.g.*, white-tailed deer, wild turkey, northern bobwhite quail, and waterfowl) in areas consistent with the military mission.

Goals, Objectives and Strategies

Table 4-17 shows the natural resources management goals, objectives, and strategies (Section 4.1) relevant to game management.

Projects and Initiatives

Projects

Participation in the following projects would occur in support of the goals, objectives and strategies for game wildlife management:

- No. 1 (Invasive Plant Removal)
- No. 2 (Prescribed Burning to Support the Gopher Tortoise CCA)
- No. 3 (Pine Planting to Support the Gopher Tortoise CCA)
- No. 4 (Listed and Species-at-Risk Species Monitoring to Support Military Activities)
- No. 5 (Habitat Improvement Through Forest Management)
- No. 6 (Shortnose and Atlantic Sturgeon Abundance and Distribution Monitoring)
- No. 7 (INRMP Review and Revision)
- No. 8 (Manatee Population Monitoring)
- No. 9 (Shoreline and Riparian Conservation)
- No. 10 (Feral, Free-Ranging, and Invasive Animal Control)

Table 4-17. Natural Resources Management Goals, Objectives, and Strategies Related to Game Wildlife Management.

Goals	Objectives	Strategies
2	2.1	NSB Kings Bay has a number of pests and exotic species (*e.g.*, fire ants, mole crickets, aphids, and mosquitoes) that occur on the installation and the control of these pests and exotics is an integral ecosystem management practice on NSB Kings Bay.
2	2.1	NSB Kings Bay would continue to monitor the health and populations of game and non-game species to ensure that wildlife do not become a nuisance to the installation or to the surrounding region.
2	2.2	NSB Kings Bay would continue to implement and update when necessary, the long-term management plan to protect and conserve the natural

Table 4-17, continued

Goals	Objectives	Strategies
		functions of wetlands and shoreline areas, including limiting wetland shoreline destruction and reducing adverse impacts to water quality.
2	2.2	NSB Kings Bay would periodically evaluate its stormwater management program and activities contributing to stormwater runoff and/or pollutant loading in stormwater runoff.
2	2.2	NSB Kings Bay would evaluate its soil erosion control management program annually and would reduce the rate of soil erosion through the implementation and maintenance of long-term measures and projects.
2	2.2	NSB Kings Bay would inventory the use of pesticides and fertilizers on NSB Kings Bay. NSB Kings Bay would continue to assess alternatives to and a reduction in pesticide and fertilizer use. The intent is to reduce chemical pesticide and fertilizer use to help protect water quality.
2	2.3	NSB Kings Bay would review all proposed activities for impact avoidance to the attenuation capacity of the 100-year floodplain. If it is determined that development is necessary within the 100-year floodplain to support the military mission, development shall be first located in the previously disturbed areas of the floodplain.
2	2.4	NSB Kings Bay would increase the number of natural areas on the installation as opportunities arise and would utilize native species for new landscaping.
2	2.5	NSB Kings Bay would continue to implement existing policies to minimize adverse impacts to ecosystem resources from land disturbance activities (*e.g.*, clearing, training).
3	3.1	Continue existing timber stand and wildlife stand improvement practices using prescribed burns and thinnings to achieve individual stand objectives, including the enhancement of habitat, maximizing sustained yield, enhancing multiple use management, reducing the potential for wildfires, and controlling diseases and insect pests.
3	3.1	Continue to establish and implement specific BMPs (GASWCC 2002; GFC 2009; SUBASE 2014) for the protection of water quality on all NSB Kings Bay (*e.g.*, wetlands, salt marsh and freshwater ponds) and surrounding water bodies (*e.g.*, Kings Bay and Cumberland Sound).
3	3.2	NSB Kings Bay would continue to update surveys for Neotropical Migratory Bird and Rare, Threatened, and Endangered Species.
3	3.2	NSB Kings Bay would implement programs and activities for the protection and enhancement of all habitat for animal and plant species.

Initiatives

1. NSB Kings Bay would institute monitoring programs to determine population levels and effective management practices for designated game and non-game wildlife species. Monitoring would range from simple inventories each year to maintaining statistics and population measurements of all game species harvested to ensure the health and quality of the populations.
2. It would be the responsibility of the Natural Resources Manager to ensure that NSB Kings Bay has up-to-date agreements. The Natural Resources Manager would consult with foresters and fish and wildlife biologists from NAVFAC SE, as well as with Federal, state, and county wildlife biologists, foresters, and land managers for assistance. The Natural Resources Manager would also consult with installation commands and departments, such as MWR.
3. Continue to maintain environmental representation on the Facilities Review Board.

4. Because of the varying habitat requirements for game species on NSB Kings Bay, the installation Natural Resources Manager and staff would identify areas for specific management in cooperation with GDNR and USFWS.
5. Continue to implement the BMPs spelled out in the SWPPP (SUBASE 2014), the *Field Manual for Erosion and Sediment Control in Georgia* (GASWCC 2002), and *Georgia's Best Management Practices for Forestry* (GFC 2009) to control erosion, sedimentation, and stormwater runoff.
6. Consult with foresters, fish and wildlife biologists, and soil conservationists from NAVFAC SE, as well as with Federal, state, and county wildlife biologists, foresters, and land managers.
7. Increase coordination of mowing schedules to coincide with seasonal wildlife requirements.
8. NSB Kings Bay would, in consultation with foresters and wildlife biologists from NAVFAC SE, as well as Federal, state, and county wildlife biologists and foresters:
    - Develop a comprehensive monitoring program to identify health, age, and sex of each deer harvested
    - Train appropriate personnel in any new monitoring techniques to be implemented on the installation
    - Train new game wardens on the installation for assistance with the game species program.
9. Use volunteers for construction of habitat enhancement projects.
10. NSB Kings Bay would institute wildlife education and stewardship programs.

Long-Term Management

Discussions of species-specific long-term management approaches and practices are presented in the following appropriate subsections.

White-Tailed Deer Management

Long-term deer management on NSB Kings Bay is accomplished by maintaining deer population density at habitat carrying capacity (at NSB Kings Bay approximately 1 deer per 30 acres of habitat under existing management) with a buck to doe ratio approaching 1:1, maintaining appropriate food supplies, manipulating habitats through various land management practices, and conducting proper monitoring activities to assess population trends.

Recreational hunting is the best management tool for maintaining a balanced deer population. Deer harvest data is compiled at a game check station and used in conjunction with monitoring data, frequency of vehicle/deer collisions, and other indices to evaluate the population.

Monitoring practices are an important component of a deer management program, and may be achieved by completing surveys, evaluating reproductive data, and measuring antler characteristics from harvested bucks.

Wild Turkey Management

Habitat management practices to enhance wild turkey populations on the installation are consistent with those outlined in Section 4.3.3.1, and WHI activities identified in Section 4.3.2.1.

Habitat Management

NSB Kings Bay would evaluate the installation for potential wild turkey habitat and would perform the necessary management techniques to enhance populations. Wild turkeys have a generalized ecology and respond favorably to many techniques employed for deer, songbirds, northern bobwhite quail and a variety of other species. Therefore, TSI and WHI activities identified earlier would include turkeys as a target species for management.

Northern Bobwhite Quail Management

The primary long-term management factors for managing northern bobwhite quail are provisions for food resources and nesting and brood rearing habitat.

Habitat Management

NSB Kings Bay would evaluate all areas for potential northern bobwhite quail habitat and would perform management practices to achieve appropriate management objectives. These practices correspond closely to those identified above for the gopher tortoise and eastern indigo snake, such as prescribed burns on a frequent rotation (2-to-3 years) and timber thinning. Because quail have high population turnover rates, populations can respond rapidly to habitat changes.

The primary component for effective quail management is the establishment of *cover,* because of its significance during each life stage of the quail. Therefore, mature upland pine forests maintained by frequent prescribed burns (2-to-3 years) interspersed with fallow fields containing abundant native forb species, such as ragweed and lespodeza is a high management priority.

Waterfowl Management

Georgia inland and coastal waters provide breeding, migratory, and wintering habitat for a number of wood ducks, several species of migratory ducks, and resident Canada geese.

Habitat Management

Table 4-18 describes the areas on NSB Kings Bay that provide waterfowl habitat. These areas are also frequented by a large number of various migratory shorebirds. Dredge Spoil Disposal Areas operational procedures emphasize elimination of the open water bodies which waterfowl and other migratory shorebirds depend upon. NSB Kings Bay would consult with the USACE to determine habitat improvement practices that do not conflict with Dredge Material Disposal operational procedures. However, it is assumed that the primary management priority for waterfowl

on NSB Kings Bay would continue to be the creation of more permanent waterfowl and migratory shorebird habitats.

Table 4-18. Description of Waterfowl Areas on NSB Kings Bay.

Habitat	Species (approximate numbers)
Dredge Disposal Site Number 1	Shovelers (100-150) Green-winged Teal (150-200) Blue-winged Teal (50-100) Insignificant numbers of diving ducks (*e.g.*, greater and lesser scaup, ruddy ducks, hooded and common mergansers, and buffleheads).
Dredge Disposal Site Number 2	Large rafts (200-250) of mixed diving ducks Wood ducks, black ducks, hooded mergansers, and common mergansers (in small numbers)
Lake D	100-150 diving ducks including greater and lesser scaup, ring-necks, and redheads. Pocket marshes provide habitat for mallards, blue-winged teal, and widgeon.
Etowah Pond	Variable numbers of diving ducks (buffleheads, hooded mergansers, and common mergensers). Occasionally, black and wood ducks occur in the shallow fringes of Etowah Pond.
Lake M5	Overwintering population of widgeon (50-75) Small flocks of green-winged teal
Pagan Creek	Overwintering population of buffleheads (25-50) and hooded mergansers (15-20)

Source: DoN, 1996.

Wood Duck Habitat Enhancement

Typical wood duck habitat is in bottomland hardwood swamps, wooded sloughs and marshes, and forested riparian areas. These wetland areas are vital habitat for waterfowl and would be managed to maintain their effectiveness for water quality control and habitat conservation (Section 4.3.1.1).

NSB Kings Bay would provide optimal habitat for wood ducks as well as other waterfowl present in smaller numbers by providing necessary habitat components. Depth of the water is important as wood ducks do not normally feed in water more than 18 inches deep. A lack of nesting cavities has been one of the primary limitations on suitable wood duck habitat. Mature and over-mature trees are vital because tree cavities (bald cypress, sycamore, ash, and blackgum provide cavities in low-lying areas) of sufficient size for nesting. NSB Kings Bay would leave snags when safe and practical and supplement natural cavities with nest boxes. To address the shortage of natural nesting cavities, NSB Kings Bay would continue the nest box program.

Climate Change

Rising sea levels, drought, depleted water resources, catastrophic wildfires, invasive plants, forest disease, and increased pests all affect the habitats that waterfowl, northern bobwhite quail, wild turkeys, and white-tailed deer require. The resulting landscape may even lose the basic habitat requirements these game require to roost, nest or bed, reproduce, and even forage.

Milder winters would likely affect the timing of avian migration and the winter distribution of waterfowl. Precipitation models suggest higher annual precipitation in Georgia, but these may be interspersed by relatively prolonged periods of drought. Prolonged drought would be a significant game management concern. Diminished wetland habitat would deter migratory stop-overs and rising sea level could result in higher-salinity wetlands that would negatively impact habitat suitability for waterfowl. The die-off of protective ground vegetation could also leave upland birds, such as northern bobwhite quail, increasingly exposed to predators and insufficient breeding areas. The increased threat of disease would be a principal concern for whitetail deer. Diseases such as epizootic hemorrhagic disease and bluetongue virus are transmitted by biting midges and are transmitted between deer when they congregate, so severe drought can enhance conditions for outbreaks by concentrating deer at fewer water sources.

4.3.3.4 Prevention and Control of Wildlife Damage and Wildlife Disease

4.3.3.4.1 Wildlife Damage

The prevention and control of wildlife damage are actions to reduce wildlife species' conflicts with people or other wildlife species.

Issue

Foxes, raccoons, white-tailed deer, gray squirrels, coyotes, feral cats, Canada geese, armadillos and feral pigs are known to occur on the installation. In addition, the installation has a large population of American alligators. The installation would monitor populations of potential nuisance species and species with histories of carrying life threatening diseases.

Goals, Objectives and Strategies

Table 4-19 shows the natural resources management goals, objectives, and strategies (see Section 4) relevant to wildlife damage issue(s) and long-term management.

Table 4-19. Natural Resources Management Goals, Objectives, and Strategies Related to Wildlife Damage.

Goals	Objectives	Strategies
2	2.1	NSB Kings Bay has a number of pests and exotic species (*e.g.*, fire ants, mole crickets, aphids, and mosquitoes) that occur on the installation and the control of these pests and exotics is an integral ecosystem management practice on NSB Kings Bay .
2	2.1	NSB Kings Bay would continue to monitor the health and populations of game and non-game species to ensure that wildlife do not become a nuisance to the installation or to the surrounding region.

Projects and Initiatives

Projects

Participation in the following projects will occur in support of the goals, objectives and strategies for wildlife damage:

- No. 1 (Invasive Plant Removal)
- No. 2 (Prescribed Burning to Support the Gopher Tortoise CCA)
- No. 3 (Pine Planting to Support the Gopher Tortoise CCA)
- No. 4 (Listed and Species-at-Risk Species Monitoring to Support Military Activities)
- No. 5 (Habitat Improvement Through Forest Management)
- No. 6 (Shortnose and Atlantic Sturgeon Abundance and Distribution Monitoring)
- No. 7 (INRMP Review and Revision)
- No. 8 (Manatee Population Monitoring)
- No. 9 (Shoreline and Riparian Conservation)
- No. 10 (Feral, Free-Ranging, and Invasive Animal Control)

Initiatives

1. NSB Kings Bay would periodically update the existing IPM plan to incorporate the most recent research on monitoring and forecasting methods and removal of exotic faunal pests on the installation. NSB Kings Bay would use education and research, as well as training, for on base land managers.
2. NSB Kings Bay would institute monitoring programs to determine population levels and the effective management practices for designated game and non-game wildlife species. Monitoring would range from simple inventories each year to maintaining statistics and measurements of all game harvested to ensure population health and quality.

Long-Term Management

Wildlife damage control is addressed in SUBASEINST 11015.6. Four steps are instrumental for assessing and responding to wildlife conflicts (Dolbeer *et al.* 1994):

1. Problem definition: to determine the species and number of individuals causing the problem, the amount of loss or nature of the conflict, and other biological and social factors related to the problem. To accomplish this, NSB Kings Bay would keep records for the following:
    - White- tailed deer - Determine the effects of browsing on native species.
    - Opossum and raccoon - Maintain records of animals that are unafraid of people.
    - Predators (*e.g.*, coyotes and feral dogs) - Maintain records of animals that are unafraid of people, and, in cases of animal deaths on the installation due to predators, determine what type of predator killed the animal.
    - Alligators - Monitor species populations and have State trained trappers prepared to remove nuisance alligators.

- Squirrels - Maintain records of damage to structures.
- Canada geese - Maintain records of populations on the installation.
- Feral Pigs – Maintain harvest records and monitor populations and damage, particularly in hardwood hammock forest.

2. Ecology of the nuisance species: to understand the life history of the species, especially in relationship to the conflict.
3. Control method: takes the information gained from parts 1 and 2 and develops an appropriate management program to alleviate or reduce the conflict.
4. Evaluation of control: assesses damage reduction in relation to costs and impact of the control on target and non-target populations and the environment.

   Information on damage prevention and control methods for wildlife species can be found in a series provided by the University of Nebraska Cooperative Extension Service, Great Plains Agricultural Council, and the USDA (http://www.ces.ncsu.edu/nreos/wild/wildlife/wdc/index.html).

Environmental Considerations During Management Practices

There is the potential for impacts on non-target species and the environment.

Applicability of Other Management Issues and NSB Kings Bay Programs

NSB Kings Bay's existing IPM plan (SUBASEINST 11015.6) is the only document directly or indirectly related to the management of wildlife damage, and would be consulted for additional management information or provided as additional training and education.

Ecosystem Management

Species are often categorized as a nuisance as a consequence of obtaining supplemental food from human sources. The supplemental food supports abnormally elevated populations of the species, which in turn has deleterious effects on other ecosystem components. Controlling wildlife damage frequently involves both returning the species to normal population levels and preventing further damage and is consistent with ecosystem management concepts.

Climate Change

Extensive periods of drought can result in decrease ground cover through vegetative die-off, which facilitates more severe ground damage via rooting and digging. Similarly, gully-washes during severe rainfall events can exasperate or facilitate wildlife-induced erosion. Planting suitable drought-tolerant vegetation in sensitive areas and either vegetative or man-made fortification of potential wash-out zones could help mitigate these impacts. Reduced forage during periods of drought could also force some animals to look for food in urbanized areas of the installation which could damage property and pose risks to residents. Securing trash cans and otherwise removing potential anthropogenic food sources would help discourage such behavior.

Laws, Executive Orders, Regulations, Directives, and Memoranda Relevant to Wildlife Damage and Disease

Forest Pest Suppression Memorandum of Agreement between the Department of Agriculture and DoD, 11 December 1990, is the planning, coordination, and execution of field operations to prevent and suppress damaging forest insects and disease outbreaks.

Additional Sources of Information

Internet Addresses:

Wildlife damage and diseases information provided by the University of Nebraska Cooperative Extension Service, Great Plains Agricultural Council, and the USDA: http://icwdm.org/handbook/allPDF/complete%20Handbook.pdf

Nuisance Wildlife Control Information: https://www.aphis.usda.gov/aphis/home/

4.3.3.4.2 Wildlife Disease

Prevention and control of wildlife disease addresses transmission between wildlife species and/or directly or indirectly from wildlife species to humans.

Issue

Diseases of wildlife can cause illness and death to individual animals and can significantly affect wildlife populations. Wildlife species can also serve as natural hosts or reservoirs for diseases that affect humans (zoonoses). Agents or parasites that cause zoonotic diseases can be contracted from wildlife directly by bites or contamination such as mosquitoes, ticks, fleas, and mites (McLean 1994).

Goals, Objectives and Strategies

Table 4-20 shows natural resources management goals, objectives, and strategies (Section 4.1) relevant to wildlife disease issue(s) and long-term management.

Table 4-20. Natural Resources Management Goals, Objectives, and Strategies Related to Wildlife Disease Control.

Goals	Objectives	Strategies
2	2.1	NSB Kings Bay would continue to monitor the health and populations of game and non-game species to ensure that wildlife do not become a nuisance to the installation or to the surrounding region.

Projects and Initiatives

Projects

Participation in the following projects will occur in support of the goals, objectives and strategies for wildlife disease control:

- No. 1 (Invasive Plant Removal)
- No. 2 (Prescribed Burning to Support the Gopher Tortoise CCA)
- No. 3 (Pine Planting to Support the Gopher Tortoise CCA)
- No. 4 (Listed and Species-at-Risk Species Monitoring to Support Military Activities)
- No. 5 (Habitat Improvement Through Forest Management)
- No. 7 (INRMP Review and Revision)
- No. 10 (Feral, Free-Ranging, and Invasive Animal Control)

Initiatives

1. NSB Kings Bay would institute monitoring programs to determine population levels and effective management practices for designated game and non-game wildlife species. Monitoring would range from simple inventories each year to maintaining statistics and measurements of game harvested to ensure population health and quality.

Long-Term Management

There have been no reports of diseases affecting wildlife or humans on NSB Kings Bay. However, NSB Kings Bay would have a long-term management policy of public awareness (*e.g.*, informing employees and visitors) about the issues of concern. Natural Resources staff would focus on, but would not be limited to, the following issues:

- Knowledge of the diseases in the area and the specific times of year that present the greatest risk of exposure.
- Knowledge of and recognition of early symptoms of diseases and the condition of exposure.
- The use of extreme caution when approaching or handling a wild animal, especially one that looks sick or acts abnormally. SUBASEINST 11015.6 specifies that only the NRM or game warden can handle or attempt to catch animals.
- The use of protective measures against fungal diseases where there is an accumulation of animal feces (*e.g.*, under bird and bat roosts).
- Protection from vector-borne disease in high-risk areas using measures such as mosquito or tick repellent or wearing special clothing.
- Reduction of host populations and their ectoparasites.

Literature on wildlife diseases and impacts on humans can be found in a series of articles provided by the University of Nebraska Cooperative Extension Service, Great Plains Agricultural Council, and the USDA (McLean 1994; http://www.ces.ncsu.edu/nreos/wild/wildlife/index.html).

Environmental Considerations During Management Practices

None.

Applicability of Other Management Issues and NSB Kings Bay Programs

The following management issues, programs, and actions are directly or indirectly related to the management of wildlife disease and would be consulted for additional management information or provided as additional training and education:

- Pest Management Plan.
- Habitat Enhancement, Section 4.3.3.1 – habitat improvement, such as bat boxes, for biological predators.

Ecosystem Management

By controlling wildlife pests and diseases, the installation is ensuring healthy sustainable wildlife populations on the installation and within the region.

Climate Change

Disease vectors, such as insects, depend upon climatic factors such as temperature, sunlight, precipitation, relative humidity, and carbon dioxide for their development and productivity. Insect growth occurs only above a minimum temperature threshold and their rate of growth increases with warming temperatures up to a maximum threshold, which is species-specific. Climate change may therefore be expected to increase the growth rate and proliferation of various insect pests, and may even facilitate the introduction of pests that were intolerant of previously-existing temperature and precipitation regimes.

Weather patterns that may concentrate wildlife under stressful conditions, such as water shortages during extended drought, can facilitate the spread of disease. For example, whitetail deer diseases such as epizootic hemorrhagic disease and bluetongue virus are transmitted by biting midges, and are transmitted between deer when they congregate. Drought could enhance conditions for outbreaks by concentrating deer at fewer water sources.

Laws, Executive Orders, Regulations, Directives, and Memoranda Relevant to Wildlife Damage and Disease

Forest Pest Suppression Memorandum of Agreement between the Department of Agriculture and DoD, 11 December 1990, is the planning, coordination, and execution of field operations to prevent and suppress damaging forest insects and disease outbreaks.

Additional Sources of Information

Internet Addresses:

Wildlife damage and diseases information provided by the University of Nebraska Cooperative Extension Service, Great Plains Agricultural Council, and the USDA:
http://icwdm.org/handbook/allPDF/complete%20Handbook.pdf

Nuisance Wildlife Control Information:
https://www.aphis.usda.gov/aphis/home/

USGS National Wildlife Health Center Web:
http://www.nwhc.usgs.gov/

4.3.3.5 Freshwater Fisheries

Fisheries resources are to be managed for sustainable populations of game fish, such as largemouth bass, bluegill, and black crappie.

Issue

Because of increased development on the installation, NSB Kings Bay ponds may experience significant sedimentation and stormwater runoff, potentially impacting future quality of these ponds as recreational fishery resources.

Goals, Objectives and Strategies

Table 4-21 shows natural resources management goals, objectives, and strategies (Section 4.1) relevant to freshwater fisheries issue(s) and long-term management.

Table 4-21. Natural Resources Management Goals, Objectives, and Strategies Related to Freshwater Fisheries.

Goals	Objectives	Strategies
2	2.1	NSB Kings Bay has a number of pests and exotic species (*e.g.*, fire ants, mole crickets, aphids, and mosquitoes) that occur on the installation and the control of these pests and exotics is an integral ecosystem management practice on NSB Kings Bay.
2	2.1	NSB Kings Bay would continue to monitor the health and populations of game and non-game species to ensure that wildlife do not become a nuisance to the installation or to the surrounding region.
2	2.2	NSB Kings Bay would continue to implement and update when necessary, the long-term management plan to protect and conserve the natural functions of wetlands and shoreline areas, including limiting wetland shoreline destruction and reducing adverse impacts to water quality.
2	2.2	NSB Kings Bay would periodically evaluate its stormwater management program and activities contributing to stormwater runoff and/or pollutant loading in stormwater runoff.
2	2.2	NSB Kings Bay would evaluate its soil erosion control management program annually and would reduce the rate of soil erosion through the implementation and maintenance of long-term measures and projects.

Table 4-21. continued.

Goals	Objectives	Strategies
2	2.2	NSB Kings Bay would inventory the use of pesticides and fertilizers on NSB Kings Bay. NSB Kings Bay would continue to assess alternatives to and a reduction in pesticide and fertilizer use. The intent is to reduce chemical pesticide and fertilizer use to help protect water quality.
2	2.3	NSB Kings Bay would review all proposed activities for impact avoidance to the attenuation capacity of the 100-year floodplain. If it is determined that development is necessary within the 100-year floodplain to support the military mission, development shall be first located in the previously disturbed areas of the floodplain.
2	2.4	NSB Kings Bay would increase the number of natural areas on the installation as opportunities arise and would utilize native species for new landscaping.
2	2.5	NSB Kings Bay would continue to implement existing policies to minimize adverse impacts to ecosystem resources from land disturbance activities (*e.g.*, clearing, training).
3	3.1	Continue existing timber stand and wildlife habitat improvement practices using prescribed burns and thinnings to achieve individual stand objectives, including the enhancement of habitat, maximizing sustained yield, enhancing multiple use management, reducing the potential for wildfires, and controlling diseases and insect pests.
3	3.1	Continue to establish and implement specific BMPs (GASWCC 2002; GFC 2009; SUBASE 2014) for the protection of water quality on all NSB Kings Bay (*e.g.*, wetlands, salt marsh and freshwater ponds) and surrounding water bodies (*e.g.*, Kings Bay and Cumberland Sound).
3	3.2	NSB Kings Bay would continue to update surveys for Neotropical Migratory Bird and Rare, Threatened, and Endangered Species.
3	3.2	NSB Kings Bay would implement programs and activities for the protection and enhancement of all habitat for animal and plant species.
3	3.3	NSB Kings Bay would establish and implement appropriate monitoring and training strategies to ensure the provision of healthy sustainable game wildlife populations.
3	3.3	NSB Kings Bay would implement programs and activities for the enhancement of habitat for fish and game species.
3	3.4	NSB Kings Bay would implement appropriate measures to protect water quality of installation fishery resources.
3	3.4	NSB Kings Bay would effectively harvest, monitor, and stock fish populations to ensure healthy sustainable fish populations.
4	4.1	NSB Kings Bay would continue the recreation planning board that addresses means for providing recreational activities. Membership on the recreation board would consist of, at a minimum, the Natural Resources Manager, a member of the Facilities Review Board and the Director of MWR. NSB Kings Bay would also consider utilizing a National Park Service (NPS) representative to review the findings of the analysis.

Projects and Initiatives

Projects

Participation in the following projects will occur in support of the goals, objectives and strategies for freshwater fisheries:

- No. 1 (Invasive Plant Removal)

- No. 2 (Prescribed Burning to Support the Gopher Tortoise CCA)
- No. 3 (Pine Planting to Support the Gopher Tortoise CCA)
- No. 7 (INRMP Review and Revision)
- No. 9 (Shoreline and Riparian Conservation)

Initiatives

1. Continue to maintain environmental representation on the Facilities Review Board.
2. NSB Kings Bay would periodically update the existing IPM plan to incorporate the most recent research on monitoring and forecasting methods and removal of exotic faunal pests on the installation. NSB Kings Bay would use education and research, as well as training, for on base land managers.
3. NSB Kings Bay would, in consultation with wildlife biologists from NAVFAC SE, USFWS and the GDNR Game Wildlife Division:
    - Continue to train appropriate personnel in any new monitoring techniques to be implemented on the installation; and
    - Continue to train new game wardens on the installation for assistance with the game species program.
4. Continue to ensure that all ponds and wetlands have a minimum of a 100-foot vegetative buffer, where a minimum amount of disturbance is allowed, to protect water quality.
5. The Environmental Department would monitor stormwater discharge into ponds and lakes to address the protection of water quality.
6. NSB Kings Bay would continue to manage point and nonpoint source stormwater in industrial areas consistent with BMPs described in the SWPPP (SUBASE 2014), and would update its SWPPP to include stormwater management practices for non-industrial areas. The SWPPP would ultimately address the maintenance of stormwater structural control; stormwater treatment projects; roadway maintenance activities; flood and soil control projects; pesticide, herbicide and fertilizer application; external connections and discharges; and construction activities.
    - Action shall be undertaken by the Environmental Director in concert with the Water Program Manager and Natural Resources Manager. Action would include consultation with Environmental Engineers and professionals from NAVFAC SE.
7. Continue to implement the BMPs spelled out in the *Field Manual for Erosion and Sediment Control in Georgia* (GASWCC 2002), and *Georgia's Best Management Practices for Forestry* (GFC 2009) to control erosion, sedimentation, and stormwater runoff. Implement the long-term management concepts in Section 4.3.1.3.
8. NSB Kings Bay would update periodically the inventory of pesticide and fertilizer use and consult the Applied Biology Department of Southern Division (843-820-7140) and the FDACS Pesticide Division (850-487-2130) for means of reduction.
9. Consider non-pesticide removal methods or removal using pesticides with lower toxicity applied at reduced rates.
10. Increase utilization of green waste as mulch and wildflower plantings and landscape activities surrounding existing water bodies.

11. The primary responsibility of the Natural Resources staff representative to the Facilities Review Board would be to ensure the use of site selection and site plan development criteria to minimize impacts to the installation's environmental and ecological resources.
12. NSB Kings Bay would institute wildlife education and stewardship programs.
13. Meet with Installation Command to discuss the potential for providing public access to outdoor recreational resources.
14. The recreation board would:
    - Present possible solutions to the issues that currently prohibit public access;
    - Identify the types of recreation and education opportunities compatible with NSB Kings Bay's mission;
    - Identify needed facilities development;
    - Consider ways to address additional access to freshwater fishery resources;
    - Examine security measures associated with expanding recreational opportunities;
    - Evaluate, contract or utilize existing cooperative agreement to evaluate carrying capacity of installation recreational programs
    - Evaluate opportunities for increased fishing access;
    - Investigate facility use agreements with other providers of educational, cultural, and recreational opportunities in the area; and
    - Survey installation personnel to identify recreational desires on the installation.

Long-Term Management

Specific management considerations for fisheries habitat include the following: 1) physical characteristics, 2) fish stocking and fish harvest, 3) water quality management, and 4) aquatic vegetation management.

Physical Characteristics

NSB Kings Bay freshwater fisheries serve a dual purpose providing stormwater retention and recreational fishing for the installation. Because of this dual purpose, NSB Kings Bay fisheries are more susceptible to changing physical conditions (*e.g.*, water quality, depth and surface area ratio). Any change to the physical characteristics of these ponds would require a reevaluation of appropriate management practices to ensure the achievement of all objectives. NSB Kings Bay would monitor physical conditions of freshwater fisheries with the assistance of a qualified Federal or State Agency through a cooperative agreement to ensure the implementation of appropriate management practices and objectives. Table 4-22 provides general information (*e.g.*, size, location, fish species and specific management practices) for each pond.

Table 4-22. Physical Characteristics of NSB Kings Bay Ponds.

Pond	Location	Surface Area (acres)	Fish Species	Management Considerations
North and South Ball Field and TRITRAFAC Ponds	West of USS James Madison Road	N/A	Ponds will be stocked with bluegill sunfish, redear sunfish, channel catfish, and largemouth bass.	1) Install fish screens. 2) Implement a water quality, fish population and aquatic vegetation monitoring and control program. 3) Enforce harvest restrictions. 4) Maintain adequate slopes to reduce the occurrence of cattails and other undesirable aquatic vegetation.
Officers Club and UEPH Pond	Near center of NSB Kings Bay support facilities on the west side.	Officer Club 5.2 UEPH Pond 4.5	Ponds will be stocked with bluegill sunfish, redear sunfish, and largemouth bass. Mercury levels will be monitored in channel catfish and largemouth bass.	1) Install fish screens. 2) Implement a water quality, fish population and aquatic vegetation monitoring and control program. 3) Enforce harvest size limits and season restrictions for fishing of May 1 to October 31. 4) Monitor fish populations for mercury contamination.
Lake D	On USS Daniel Webster Road between USS Ben Franklin and the St. Marys Gate	120	Varying depth allows management for a variety of fish species (*e.g.*, bluegill sunfish, redear sunfish, channel catfish, and largemouth bass)	1) Enforce harvest limits. 2) Design and implement a fertilization schedule. 3) Implement a water quality, fish population and aquatic vegetation monitoring and control program. 4) Install fish screens and spawning containers for channel catfish.
Stimson 1,2 and 3	Along USS Henry L. Stimson Drive	Stimson 1 5.1 Stimson 2 8.4 Stimson 3 6.6	All ponds managed for Channel Catfish because of the extreme variation in shoreline created by the automatic gate outfalls.	1) Will not fertilize 2) Install fish screens 3) Design and initiate an artificial feeding program 4) Implement a fish count, water quality and aquatic vegetation monitoring programs

Table 4-22, continued.

Pond	Location	Surface Area (acres)	Fish Species	Management Considerations
Monroe 1, 2, 3, 4	Both sides of USS Sam Houston Road	Monroe 1 3.7 Monroe 2 5.7 Monroe 3 4.8 Monroe 4 2.1	Ponds 1 and 2 managed for bass/bluegill ponds. Ponds 3 and 4 managed as fertilized bass/bluegill pond	1) Install fish screens at all outfalls. 2) Investigate catfish feeding program for ponds 1 and 2. 3) Implement a water quality, aquatic vegetation and fish monitoring and restocking program. 4) Fertilization program for ponds 3 and 4. 5) Enforce harvest policies.

Source: USFWS 1986.

Key: UEPH = Personnel Housing, TRITRAFAC = Trident Training Facility.

Water Quality Management

NSB Kings Bay would monitor water quality in all freshwater ponds to determine necessary corrective actions in order to maintain appropriate recreational fishing resources. Chemical (*e.g.*, pH, alkalinity, total hardness, and dissolved oxygen) as well as physical properties of the water (e.g. clarity) are important indicators of pond health for fisheries management purposes. A standard field ecology water testing kit should be used to test each managed pond. Table 4-23 presents the parameters to be measured and the preferred ranges for the measurements.

Table 4-23. Water Quality Parameter Ranges.

Parameter	Preferred Range
Dissolved oxygen	5-saturation (ppm)
Carbon Dioxide	0-15 (ppm)
Total Alkalinity	50-400 (mg/L)
Total Hardness	50-400 (mg/L)
PH	6.5-9.0

Source: USFWS 1986.

Corrective actions for NSB Kings Bay water quality problems include:

1. The use of lime, which is the most common pond treatment in the southeast because of the presence of acidic soils, acid rain, and acidic runoff from decaying leaves and pine straw. Lime raises the pH and increases the availability of nutrients, thus making fertilization more effective. Lime also buffers the water to prevent stressful fluctuations in water chemistry; ponds that require lime may have drastic changes in pH (relative acidity) from morning to evening on a bright sunny day. Lime also provides the benefit of helping to clear muddy ponds by encouraging sediments to settle out more quickly. Take

sediment samples from several locations in the pond and send to the University of Georgia Extension Service Soil Testing Laboratory for analysis.

2. The use of proper amounts of fertilizer as identified in Table 4-24. Fertilization will not stimulate a good phytoplankton bloom if alkalinity is below 20 ppm. Proper fertilization will:
   - increase food availability throughout the food chain, thereby, indirectly increasing pond carrying capacity;
   - can double the stocking rate as compared to unfertilized ponds and may increase the size of individual fish; and
   - increase primary productivity (algae) and the availability of food for aquatic insects and other organisms that are consumed by fish.

Table 4-24. Recommended Pond Fertilization Rates.

Fertilizer Formulation	Pounds/Acre/Application
Granular	
20-20-5	40
16-20-5	40
18-46-0	18
0-46-0	18
Liquid	
13-38-0	10
10-34-0	10
Water Soluble	
10-52-4	2-8
Controlled Release (Powdered)	
13-13-13	69

Source: Alabama Wildlife Management, 1999.

Aquatic Vegetation Management

NSB Kings Bay ponds have been affected by increased aquatic vegetation (*e.g.*, cattails and other species) and will continue to be affected because of the increased stormwater runoff (Section 4.3.1.3). The presence of aquatic vegetation in recreational fishing ponds is undesirable for several reasons. Aquatic plants use available nutrients, thus preventing proper algal blooms. They provide cover for prey fish that can limit the availability of this food source for largemouth bass, resulting in overcrowding and stunted growth. Extensive vegetation coverage can also result in the depletion of dissolved oxygen from the water during the processes of decay.

Corrective actions would be implemented at the discretion of the Natural Resources Manager for the treatment of aquatic weed infestations, which include the following:

- Proper fertilization of NSB Kings Bay ponds. Fertilization can prevent vegetation from becoming established in ponds greater than 3 feet deep. Fertilizer promotes algal blooms that prevent sunlight from reaching the bottom and prevents plants from becoming established. However, in ponds with shallow edges or excessive flow, fertilization will not be effective.
- Stocking NSB Kings Bay ponds with grass carp (sterile; *Cteno pharyngodon idella*) can also serve as a natural, biological control of unwanted plant growth. Grass carp are not effective as a means of control for woody plants that commonly grow along the edges of ponds in the Southeast, such as button bush, willows, and alders. A GDNR permit is necessary to stock open water (*e.g.*, ditches, ponds) with triploid (sterile) grass carp to consume existing vegetation or as a preventative measure. Stocking rates for grass carp depend on plant species, plant densities, and plant distribution. Grass carp will be stocked at rates recommended by GDNR fisheries biologists.
- Mechanical controls include winter drawdowns, deepening pond edges, and manual/mechanical removal of vegetation. Winter drawdowns can control aquatic vegetation by exposing them to freezing and drying and is particularly effective along shallow edges. Water levels in the pond should be reduced during two to four successive years from late fall to early spring.
- If problem vegetation cannot be removed by the means discussed above, herbicides can be used as a spot treatment or as temporary control of vegetation. Many variables must be considered and researched before using herbicides. Proper identification of a nuisance plant is essential when choosing an herbicide as no single herbicide is effective for all plants. Knowledge of the pond's water volume and/or surface area is important when deciding on application amounts and methods. More information on aquatic plant control, herbicide use, and Federal and state regulations is available through the University of Florida at http://aquat1.ifas.ufl.edu/a-title.html. Once unwanted vegetation is removed from a pond, fertilization is the best treatment to prevent reestablishment.

Environmental Considerations During Management Practices

Fish species and water quality of the ponds may be affected during alterations in the physical characteristics (*e.g.*, grading, shaping slopes or increasing depth) to enhance the fisheries habitat.

Applicability of Other Management Issues and NSB Kings Bay Programs

The following management issues and programs are directly or indirectly related to habitat management and will be consulted for additional management information:

- Landscaping, Section 4.3.1.4 – enhance aesthetic qualities of the ponds.
- Wildlife Management, Section 4.3.3 – enhance ecological qualities of ponds.

Ecosystem Management

Various wildlife species will benefit from the habitat provided by a properly managed fishpond. Well-managed ponds will also provide an outstanding recreational resource as well as educational and interpretive opportunities.

Climate Change

Terrestrial regions have warmed faster than the oceans thus far, with associated temperature increases in ponds, lakes, rivers, and wetlands. Freshwater systems are also subject to a series of non-climate stressors such as eutrophication, habitat degradation, and invasive species, which can be exacerbated by extreme weather events. As air temperatures increase, so do evaporation rates, which lowers the water levels of closed-system ponds and lakes. Maintaining and restoring shoreline plant communities, both in the water and on the banks, encourages natural pond processes to mitigate some impacts of climate change. Vegetation emerging from the substrate stabilizes shorelines against erosion and protects water quality by intercepting human-derived nutrients and pollutants. When pond vegetation is degraded, shorelines are more vulnerable to erosion and water quality degradation. Continued increases in air temperatures and changing precipitation regimes associated with climate change can have profound impacts on pond biota and water quality.

Laws, Executive Orders, Regulations, Directives, and Memoranda Relevant to Freshwater Fisheries Enhancement

Federal Water Pollution Control Act, as amended by the CWA of 1977, 33 USC 1251, prohibits the discharge of dredged or filled materials into waters of the United States, including wetlands, without first obtaining a permit from USACE (Section 404 of the CWA).

Fish and Wildlife Coordination Act as amended; Public Law 85-624, 16 USC 661 et seq., this law was enacted to ensure that fish and wildlife conservation receives consideration equal to, and coordinated with, other features of water resources programs. Section 10 of the Act directs Federal agencies to consult the USFWS, NMFS, and the appropriate state agencies before authorizing alteration to water bodies.

EO 11990, 24 May 1977, as amended, requires government agencies, in carrying out agency actions and programs affecting land use, to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.

Clean Water Act: Section 401 Water Quality Certification, 1986, 33 USC 1341, requires that states certify compliance with Federal permits or licenses and with state water quality requirements and other applicable state laws. Under Section 401, states have the authority to review any Federal permit or license that may result in a discharge to wetlands or other waters under the State's jurisdiction to ensure that the actions would be consistent with the State's water quality requirements.

EO 13112, 3 February 1999, requires executive agencies to restrict the introduction of exotic organisms into natural ecosystems.

OPNAV M-5090.1D, 12-3.8(b), discusses natural resources management relating to wetland management.

Additional Sources of Information

Books:

Managing Wildlife, Alabama Wildlife Federation, 1999.

Fisheries Management Plan for Man-made Lakes on the Naval Submarine Support Base, Kings Bay, Georgia, USFWS, January 15, 1986.

4.3.4 Outdoor Recreation Issues

Outdoor recreation facilities include interpretive (education) centers, where the focus is on understanding the natural environment and utilizing game check stations and fishing piers. Activities may include, but are not limited to, nature trails, picnic and camping areas, consumptive and non-consumptive uses of natural resources, establishment and management of recreational trails, and educational opportunities. Outdoor recreation does not include highly developed outdoor uses such as golf courses, tennis courts, ball/athletic fields, marinas, or swimming pools.

Issue

There are two issues related to recreational activities. First when considering the anticipated growth of the installation, more improved recreational facilities and services will be needed. As growth occurs, already limited recreational facilities and services will become more limited as demand increases, and as additional property is committed to non-recreational use. The second issue involves how to provide outdoor recreational opportunities to the public in adherence to military mission and security requirements.

Goals, Objectives and Strategies

Table 4-25 shows the natural resources management goals, objectives, and strategies (Section 4.1) relevant to the outdoor recreation issue(s) and long-term management.

Table 4-25. Natural Resources Management Goals, Objectives, and Strategies Related to Outdoor Recreation.

Goals	Objectives	Strategies
1	1.2	NSB Kings Bay would maintain an ecosystem management awareness and training/education program available to all interested NSB Kings Bay personnel.
1	1.2	NSB Kings Bay would participate in regional stewardship/research programs that foster citizen participation in ecosystem education and stewardship.

4	4.1	NSB Kings Bay would continue the recreation planning board that addresses means for providing recreational activities. Membership on the recreation board would consist of, at a minimum, the Natural Resources Manager, a member of the Facilities Review Board and the Director of MWR. NSB Kings Bay will also consider utilizing a National Park Service (NPS) representative to review the findings of the analysis.
4	4.2	Expand, improve, and provide additional facilities for recreational opportunities on NSB Kings Bay.
4	4.2	NSB Kings Bay would prepare a survey to identify recreational preferences of installation personnel.

Projects and Initiatives

Projects

Participation in the following projects will occur in support of the goals, objectives and strategies for outdoor recreation:

- No. 1 (Invasive Plant Removal)
- No. 2 (Prescribed Burning to Support the Gopher Tortoise CCA)
- No. 3 (Pine Planting to Support the Gopher Tortoise CCA)
- No. 4 (Listed and Species-at-Risk Species Monitoring to Support Military Activities)
- No. 5 (Habitat Improvement Through Forest Management)
- No. 6 (Shortnose and Atlantic Sturgeon Abundance and Distribution Monitoring)
- No. 7 (INRMP Review and Revision)
- No. 8 (Manatee Population Monitoring)
- No. 9 (Shoreline and Riparian Conservation)
- No. 10 (Feral, Free-Ranging, and Invasive Animal Control)

Initiatives

1. For program development, enlist the services of foresters, fish and wildlife biologists, and soil conservationists from NAVFAC SE, as well as Federal, state, and county wildlife biologists, foresters, and land managers.
2. NSB Kings Bay would consider participation and/or coordination of a regional multi-agency effort to develop a geographic information system (GIS) database to identify wetland types, soils, geologic characteristics, landscape positions, and functional assessment field scores
3. Meet with Installation Command to discuss the potential for providing public access to outdoor recreational resources.
4. NSB Kings Bay would develop and deliver funded surveys to installation personnel with technical assistance provided by the NPS.
5. The recreation board will:

- Present possible solutions to the issues that currently prohibit public access;
- Identify the types of recreation and education opportunities compatible with NSB Kings Bay's mission;
- Identify needed facilities development;
- Consider ways to address additional access to saltwater resources;
- Examine security measures associated with expanding recreational opportunities;
- Evaluate, contract or utilize existing cooperative agreement to evaluate carrying capacity of installation recreational programs
- Evaluate opportunities for increased hunting and fishing access;
- Investigate facility use agreements with other providers of educational, cultural, and recreational opportunities in the area; and
- Survey installation personnel to identify recreational desires on the installation.

Long-Term Management

The military mission of the installation severely restricts its use as a recreation provider to the general public. Presently, NSB Kings Bay provides a variety of concentrated and dispersed outdoor recreational activities (Section 3.7). Because of this, NSB Kings Bay would concentrate on providing public access facilities for education and stewardship purposes. This would include the use and additional provision of Watchable Wildlife areas throughout the installation. NSB Kings Bay would continue to provide hunting, fishing, interpretive, and educational opportunities to school groups, conservation groups, and other interested personnel, as well as concentrated and dispersed recreational activities on NSB Kings Bay for DoD retired, DoD Civilian, and military personnel.

New recreational activities will be concentrated within two designated Special Interest areas (see Figure 7-2 in Chapter 7), which have a large amount of natural resources and offer opportunities for education, demonstration, and research. During the planning and siting of new recreational activities for DoD and military personnel, the installation will evaluate the feasibility of offering recreational resources to the general public. Any future recreational development on the installation will not be allowed to adversely impact wildlife species or their habitats or the NSB Kings Bay military mission.

Of primary concern to the installation is the access to saltwater resources at NSB Kings Bay. Fishing resources are abundant and fishing is very popular in the region. Saltwater boating access is currently limited to two off-installation boat ramps: one located on the northern end of Highway 40 adjacent to Crooked Island State Park and the other in downtown St. Marys, Georgia, each of which, are roughly 5 to 10 miles from the installation's main gate. Saltwater boating access is not available on NSB Kings Bay or within designated waters surrounding NSB Kings Bay. To make saltwater

fishing more accessible to persons authorized to fish on NSB Kings Bay, the North River will be opened to fishing from the banks.

Portions of the installation have been opened to the public. This includes most of the northern portions of NSB Kings Bay including Etowah Park.

Environmental Considerations During Management Practices

Environmental considerations will depend on the type and location of facility being developed, but may include impacts to terrestrial and aquatic wildlife species and habitats, water quality, and soils.

Applicability of Other Management Issues and NSB Kings Bay Programs

The following management issues, programs, and actions are directly or indirectly related to the management of outdoor recreation, and will be consulted for additional management information, or provided as additional training and education:

- Habitat Enhancement, Section 4.3.3.1 – watchable wildlife;
- Wetlands, Section 4.3.1.1 – buffers for watchable wildlife; and
- Using volunteer groups, including local Scout troops and interested base personnel, to offer hands-on training or individual participation in the development of outdoor recreational facilities.

Ecosystem Management

Ecosystem management practices are enhanced by educating the general public about environmental conservation issues, problems, and solutions. By providing recreational and educational opportunities on the installation, NSB Kings Bay would help promote public awareness of natural resource issues, thus providing a local educational resource. In addition, using volunteer groups and/or installation personnel for the physical construction of recreational and educational facilities provides opportunities for educating group members on the values and characteristics of a healthy environment.

Laws, Executive Orders, Regulations, Directives, and Memoranda Relevant to Outdoor Recreation

Sikes Act and Improvement Act of 1997, 16 USC 670a(b)(1)(G), requires public access to a military installation for the necessary, appropriate, and sustainable use of natural resources by the public to the extent that the use is not inconsistent with the needs of the fish and wildlife resources or with safety and military security.

Outdoor Recreation – Federal/State Program Act, 16 USC 460 P-3, defines a program for managing lands for outdoor recreation.

OPNAV M-5090.1D, 12-3.11, discusses natural resources management relating to the protection and management of outdoor recreational resources.

Additional Sources of Information

Telephone Contacts:

National Park Service – Southeast Regional Office – (404) 562-3100

University of Georgia – Recreation Technical Assistance Office- (706) 542- 6173

GDNR- Wildlife Resources Division – (770) 918-6401

5 Environmental Planning and Mission Suitability

This section discusses the military mission for NSB Kings Bay and the interaction of the military mission and natural resources management.

5.1 NSB Kings Bay Mission

The mission of NSB Kings Bay is focused on delivering support to the TRIDENT submarine.

TRIDENT Submarine Mission

NSB Kings Bay is the only East Coast installation capable of supporting the TRIDENT submarine mission. Therefore, the operation of NSB Kings Bay as the homeport for the TRIDENT submarine is critical to the national defense strategy. The specific military mission of the TRIDENT submarine has three major components: 1) the submarine, 2) the missile, and 3) the support site. Each component is equally essential to the continuance of the military mission at NSB Kings Bay.

The Submarine. Submarines located at NSB Kings Bay are classified as Ohio-class/TRIDENT and GN'S ballistic missile submarines. These submarines provide the sea-based "leg" of the triad of U.S. strategic offensive forces. TRIDENT submarines were designed for ease of operation and maintenance, with rotating equipment pools, decreasing refit turnaround time, thus increasing the submarine's availability for patrol.

The Missile. The missile is vital to the continuance of the TRIDENT mission. TRIDENT missiles have undergone many changes over the past 30 years, beginning with the use of the Poseidon missiles, which were used primarily by Submarine Squadron Sixteen, and followed by the TRIDENT I (C-4) missile, which was similar in size to the Poseidon, but with increased propellant. The TRIDENT D-5 missile, which has increased propellant and range over the TRIDENT I (C-4), arrived most recently.

The Support Site. The support site provides logistic support for the TRIDENT submarine. Because of the increased range of the TRIDENT missile, it became possible to provide base facilities for the TRIDENT submarine force at a continental United States port. Logistical support is streamlined as ships are able to dock in a United States port for refit, crew training, and supply and base programs necessary for the support of the TRIDENT mission.

5.2 Encroachment

The majority of NSB Kings Bay is surrounded by water and estuarine marshes. Because NSB Kings Bay has no runways, encroachment into clear zones or AICUZs is not an issue. However, residential development along the southern perimeter of NSB Kings Bay has begun in recent years and the development is water-centered with a marina and many residences having water access for boats and water-related recreation. There is the potential as development increases for conflicts between increased boating and water-related recreational activity associated with nearby residential development and NSB Kings Bay operations.

North Atlantic right whale critical habitat restrictions may pose encroachment concerns to NSB Kings Bay operations. Critical habitat restrictions on maneuvers can affect vessel and submarine navigation. Similarly, marine mammals, sea turtles, and endangered and threatened species such as Eastern indigo snake pose limitations upon NSB Kings Bay vessels and submarine operations, planning and development.

5.3 Impacts to Military Mission from Natural Resources Management

Installation and management activities that are detrimental to the functional values of wetlands (*e.g.*, storage and purification of water) on NSB Kings Bay can potentially affect the military mission of NSB Kings Bay. For example, wetland systems on the installation provide water storage and purification prior to discharge into Kings Bay and Cumberland Sound. Changes to these systems from operations or loss of functions can affect water quality downstream and in nearby estuaries. Similarly, uncontrolled soil erosion has the potential to increase sediment loading in stormwater runoff, which may increase turbidity and reduce water quality in Kings Bay and Cumberland Sound, jeopardizing vital aquatic habitat. Furthermore, increased soil erosion within the watershed over the past several years has resulted in greater dredging costs and reduction of spoil disposal area capacity. Without reforestation, sites that have been clear-cut may experience excessive erosion problems that could potentially increase levels of turbidity and sedimentation. Conditions detrimental to the water quality of the bay would likely result in an enforcement action and may be ordered discontinued by GDNR. If groundwater standards established by EPA are exceeded at the land application sites, EPA could shut down the land application process.

Because inappropriate landscaping and maintenance practices (*e.g.*, excessive use or application of inappropriate pesticides) may potentially affect Federally and state-designated endangered or threatened species and/or water quality, consequent regulatory actions by agencies

such as the USFWS, GDNR, or USACE could threaten the NSB Kings Bay military mission. However, appropriate landscaping and maintenance practices need to be implemented for the safety of military dependents and quality of life for all personnel.

Significant pest or disease outbreaks within NSB Kings Bay timber stands may require restricting access to these areas, which may threaten the continuance of the military mission on the installation. 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 installation to control a problem.

Outdoor recreational use by the public can affect the security and safety of the military mission. Outdoor recreational opportunities must be planned, developed, and used consistently within the constraints of the military mission. The northwestern section of NSB Kings Bay is open to public access, including the golf course and housing area. This makes the area more susceptible to wildfires, illegal dumping, and poaching if not properly managed.

Dolphins, manatees (as well as other marine mammals), and sea turtles are federally-protected, and can be affected by interactions with vessels, sonar, and captive surveillance marine mammals. Therefore, the abundance and distribution of marine mammals in Kings Bay and Cumberland Sound and their behavior can affect the military mission.

The waters offshore of Georgia and Florida are critical habitats for North Atlantic right whales (NMFS 2005). North Atlantic right whales are known to winter and birth calves in these waters during the months of December through March (Sebastian Inlet, Florida to the Altamaha River, Georgia). Special measures are to be taken in this area by naval vessels and submarines during calving months. If a North Atlantic right whale or other endangered species is observed, additional measures are to be taken. Vessel and submarine protocols are outlined in the NMFS BO dated May 15, 1997. Violation of these measures could adversely affect the military mission.

Coastal waters and estuaries are EFH for many federally protected reef and coastal fish. Dredging in the rivers and ports may affect the habitat of protected fish. Dredging in navigable waters requires a Federal permit and issuance of the permits may be delayed if it is determined that operations are adversely affecting fish habitat. In addition, installing obstructions in navigable waters such as docks and navigational aids requires Federal and State permits. These permits can be delayed if the USACE and/or GADNR determines that the actions will create an adverse effect on EFH. NSB Kings Bay should carefully consider EFH in facility planning and development.

Some encroachment issues may require a more intensive NEPA analysis. This is especially true as NSB Kings Bay operations and new facilities could have impacts on adjacent land and water use, and residential and commercial zones.

5.4 Impacts to Natural Resources Management from Military Mission

Disturbance to soils and vegetated areas from NSB Kings Bay operations, and transport of foreign material (i.e. soil, building materials) onto NSB Kings Bay could cause an increase in invasive and exotic flora and fauna. Invasive and exotic fauna may displace or degrade habitat for native fauna, thus altering ecosystem function. Outdoor recreational opportunities are dependent upon the environment and the security and safety constraints of the military mission. Outdoor recreational opportunities must be planned, developed, and used consistently with sustainability of the land. Unplanned recreation areas may be over-utilized or improperly located such as in areas of the base fully open to public access. The over-utilization or improper location of an outdoor recreation area may negatively affect natural resources. Restricting recreational wildlife harvest (*e.g.*, white-tailed deer) can allow wildlife populations to exceed the carrying capacity of the habitat creating potential for wildlife over-browsing and increased risk of wildlife disease and parasite transmission.

Channel dredging for submarine access increases turbidity, can potentially injure wildlife, including sea turtles, and can limit access to public areas while dredging is conducted. Dredging impacts are monitored and appropriately mitigated, although localized turbidity and the risk of injury to wildlife are not completely eliminated. Although dredging activities are brief, the public does temporarily lose recreation opportunities while dredging in public areas occurs.

Interactions between marine mammals and vessels (*i.e.*, vessel strikes, noise) and between marine mammals and captive surveillance mammals could negatively affect marine mammals in Kings Bay and Cumberland Sound. Helicopter flights over NSB Kings Bay have been used to monitor some threatened and endangered species populations (*e.g.*, wood stork) but low-level civilian helicopter flights over NSB Kings Bay are restricted due to the military mission and these restrictions have an impact on the ability to manage certain threatened and endangered species populations on NSB Kings Bay.

Security restrictions in portions of NSB Kings Bay reduce public access to recreational resources, such as lands for hunting, bird watching, and hiking and waters for fishing and boating. NSB Kings Bay operations also remove other areas for recreational use due to noise or safety concerns.

Forested areas along roads within NSB Kings Bay are periodically cleared and maintained for security purposes. The loss of forested habitat from safety and security needs affects the forested resources of NSB Kings Bay. Prescribed burns are utilized to manage forest resources and wildlife habitat on NSB Kings Bay. However, smoke from prescribed burns, if not properly controlled or

coordinated with NSB Kings Bay operations, could impact the military mission, causing an alteration or cessation of prescribed burns. This would impact forest and wildlife management activities on NSB Kings Bay.

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6 Implementation

Section 6 describes the projects that are proposed for implementation by NSB Kings Bay. Projects were identified by the NSB Kings Bay Natural Resources Manager in consultation with foresters, fish and wildlife biologists, and soil conservationists with NAVFAC SE, as well as with Federal, state, and county wildlife biologists, foresters, and land managers. For each project, Section 6 discusses the purpose, location, description, cost, relevance to the goals and objectives listed in Section 4, baselines, and monitoring and legal requirements. It is the intent of NSB Kings Bay to implement the projects as described to the greatest extent possible. The implementation of projects is largely dependent upon availability of funds and adequate levels of staffing. Recognizing the uncertainties in funding and the possibility of changes to NSB Kings Bay's military mission and its civilian and military staffing, the implementation of projects will proceed as directly and completely as possible. However, it is recommended that the minimum necessary natural resources staffing include full-time positions for a Natural Resources Manager, a game warden and a forester. All actions contemplated in the INRMP are subject to the availability of funds properly authorized and appropriated under Federal law. Nothing in this INRMP is intended to be nor must be construed to be a violation of the Anti Deficiency Act (31 U.S.C. 1341et seq.).

Funding for implementation of the INRMP would come from the Installation, CNIC, or Naval Facilities Engineering Command natural resources fund sources. 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 O & M (N) Environmental, or other funding to implement DoD mandatory projects, in the timeliest manner possible. Stewardship-type projects will be funded through forestry, agricultural outlease, fish and wildlife, Legacy, or other fund sources as funding and personnel resources become available. Table 6-1 summarizes the projects.

Table 6-1. Summary of INRMP Projects.

Project No.	EPR Number	Project Description	Scheduled Implementation Date (FY)	Prime Legal Driver	Funding Priority Class[a]	Budget Criteria[c]	Source of Funds
1	4223750248	Invasive Plant Removal	FY 2019-24	1, 7, 10	M	12106	ENV, STA
2	42237FOR01	Prescribed Burning to Support the Gopher Tortoise Candidate Conservation Agreement	FY 2019-24	11, 12	M	12108	FOR
3	42237FOR02	Pine Planting to Support the Gopher Tortoise Candidate Conservation Agreement	FY 2019-24	11, 12	M	12108	FOR
4	4223750275	Listed and Species-at-Risk Species Monitoring to Support Mission Activities	FY 2019-24	2, 4, 8	M	12104	ENV, STA
5	4223750281	Habitat Improvement Through Forest Management	FY 2019-24	2, 4	M	12104	ENV, STA
6	4223750340	Shortnose and Atlantic Sturgeon Abundance and Distribution Monitoring	As Needed	2, 4	M	12104	ENV, STA
7	4223700001	INRMP Review and Revision	FY 2019-24	2	M	12103	ENV
8	4223750117	Manatee Population Monitoring	FY 2019-24	4, 9	M	12104	STA
9	4223700282	Shoreline and Riparian Conservation	As Needed	3, 5, 10	S	12107	STA
10	4223750366	Feral, Free Ranging, and Invasive Animal Control	FY 2019-24	4, 6, 7, 8	M	12106	ENV

Notes:: [a] From DOD Instruction 4715.3, Enclosure (4)
[b] From EPR "Guidebook"
[c] "Guidebook Number" is from Chapter 12 of EPR Guidebook

Funding Priorities: M = Mandatory
S = Stewardship

Sources:: ENV = Environmental O&M(N),
FOR = Forestry,
STA = Station O&MN

Drivers::
(1) 7 USC 2814= Management of Undesirable Plants on Federal lands
(2) 16 USC 670a-f = Sikes Act Improvement Act
(3) 16 USC 1456 = Coastal Zone Management Act
(4) 16 USC 1531 & 1536 = Endangered Species Act
(5) 33 USC 1251 = Clean Water Act
(6) 6 USC 703 = Migratory Bird Treaty Act
(7) EO 13112 = Invasive Species
(8) EO 13186 = Responsibilities of Federal Agencies to Protect Migratory Birds
(9) 16 USC 1361-1407 = Marine Mammal Protection Act
(10) 16 USC 2912 = North American Wetland Conservation Act
(11) 32 CFR 190 = Natural Resources Management Program
(12) DOD INST 4715.3 = Environmental Conservation Program

Project No. 1: Invasive Plant Removal

Cost:	FY20: $27,400 with a 2% annual inflation rate.
Purpose:	The removal of invasive and exotic species to ensure continuation of native species and wildlife habitat ecosystem.
Goals and Objectives:	Goal 1, Objective 1.2 – Training and Education Goal 1, Objective 1.2 – Citizen Participation Goal 3, Objective 3.1 – Native Biological Communities Goal 3, Objective 3.2– Habitat Enhancement Goal 3, Objective 3.3 - Game Species Habitat Enhancement
Location:	Installation-wide
Description:	This project would include the survey and continuous monitoring of NSB Kings Bay to ensure the removal of invasive species. NSB Kings Bay would consult with the GDNR concerning the management of exotic species on the Installation.
Baseline:	Baseline will be established during Phase I of this project.
Monitoring:	This project would provide the monitoring necessary for the evaluation and removal of invasive and exotic species when present.
Hours:	This project would use NSB Kings Bay's maintenance crew, private contractors, volunteers, and/or cooperating personnel. Estimated NSB Kings Bay staff hours = 150
Budget/Fund Source:	Class III – Recurring, Agriculture Outlease or Forestry Reserve Funding
Assessment Level:	Level 1
Type:	Mandatory/Recurring
Legal Driver(s):	7 USC 2814(a)… "Each Federal agency shall – (1) designate an office or person adequately trained in the management of undesirable plant species to develop and coordinate and undesirable plants management program (2) establish and adequately fund an undesirable plants management program; (3) complete and incorporate cooperative agreements with State agencies regarding the management of undesirable species; (4) establish integrated management systems to control or contain undesirable plant species targeted under cooperative agreements." EO 13112 " Each Federal agency… shall, to the extent practicable and permitted by law,…subject to the availability of appropriations, and within Administrative budgetary limits, use relevant programs

and authorities to: prevent the introduction of invasive species, detect and respond rapidly to and control populations of such species…; monitor invasive species populations accurately and reliably; provide for restoration of native species…; conduct research on invasive species…; and promote public education on invasive species…" None.

Related Legal: 16 USC 670 a-f

Accomplishments: An invasive plant survey was completed as part of a rare plant and gopher tortoise survey in 2002[1]. Botanists from GDNR conducted a survey of invasive plants on NSB Kings Bay in 2017[2]. In response to their findings, the Navy awarded a contract in 2018 to target salt cedar (*Tamarix canariensis*) and Chinese tallow (*Triadica sebifera*) for eradication.

[1] Department of the Navy, Southern Division. 2004. Invasive and Rare Plant Survey and Distribution Status of the Gopher Tortoise (*Gopherus polyphemus*) at Kings Bay Naval Submarine Base, Kings Bay, Georgia. Final. Contract No. N62467-00-D-0320. September 2004.

[2] Leonard, E., J. Thompson, and J. Lee, 2018, Ecological Studies and Management at Naval Submarine Base Kings Bay, Georgia, Prepared for Naval Submarine Base Kings Bay, Prepared by Georgia Department of Natural Resources, Brunswick, Georgia.

Project No. 2: Prescribed Burning to Support the Gopher Tortoise Candidate Conservation Agreement

Cost: FY20: $32,200 with a 2% annual inflation rate.

Purpose: NSB Kings Bay forest stands require prescribed burns and forest thinning to promote healthier more sustainable forest resources, to reduce fuel loads and the associated potential for wildfires, and to ensure the continuation of fire-dependent plant and wildlife species. Periodic inventory of the forest stands is required to know when prescribed burns, thinning, harvest and regeneration is required.

Goals and Objectives: Goal 2, Objective 2.1 – Removal of Nuisance Plants and Wildlife Animals and Diseases

Goal 2, Objective 2.2 – Wetland Enhancement

Goal 2, Objective 2.3 – Floodplain Enhancement

Goal 3, Objective 3.1 – Site Preparation

Goal 3, Objective 3.2 – Habitat Enhancement

Goal 3, Objective 3.3 – Game Species Habitat Enhancement

Location: Prescribed burns would be completed in all pine plantations and pine flatwoods. Urban forest prescription precautions would be in effect when burning close to base housing, administrative areas, and training areas. Forest thinning and harvesting activities would occur installation-wide.

Description: NSB Kings Bay would continue prescribed burns, forest thinning activities and forest inventories as part of this project. NSB Kings Bay would attempt to burn on a three-year rotation (one third of the forest stands would be burned every year), or burns would be scheduled at the discretion of the Natural Resources Manager. Prescribed burns would be completed primarily within pine flatwood communities and pine plantations which are all seasonal wetland communities. These communities include slash pine, longleaf pine, and loblolly pine and comprise a major portion of all timber stands on the installation. Various types of fires (*e.g.*, backing, flanking, strip fires, night fires or aerial ignition) would be utilized as determined by the NSB Kings Bay Natural Resources Manager. Primary fire types include backing or flanking fires and if conditions are favorable, staff may use strip fires in tracts of 50 acres or less. NSB Kings Bay would consider the use of growing season fires to enhance reforestation efforts (see Section 4.3.2.3) of longleaf pine on the Installation. Growing season burns would be used at the discretion of the Natural Resources Manager and would be dependent upon existing weather conditions.

Forest thinning activities would be conducted to thin managed forest areas, enhance wildlife habitat, convert slash pine to longleaf pine on suitable sites, and obtain proceeds from the sale of the timber products. For pine flatwoods and pine plantation, the harvest cycle would begin when the stand reaches merchantable size (approximately 13 to 15 years) and would continue every 7 to 10 years until the rotation age (50 years for pine). However, the harvest cycle would be scheduled at the discretion of the Forester and Natural Resources Manager, including small group selection harvests in mixed pine/hardwood stands. For southern mixed hardwoods, stands would be primarily managed through periodic thinning to promote forest health and have a minimal rotational age of 80 years. NSB Kings Bay would manage the Land Application area on a 20-year rotation. Any monies received shall be turned over to the servicing Comptroller for deposit into the DoD Forestry Fund. NSB Kings Bay would consult with the USFWS on practices to enhance habitat and minimize negative impacts on non-game bird populations during forest management activities.

NSB Kings Bay would establish longleaf pine on appropriate sites as selected by the Natural Resources Manager and Forester. The longleaf pine ecosystem would enhance available habitat for many wildlife species, would flourish under the proposed intensive fire regime, and would produce a healthier, higher quality product at harvest.

NSB Kings Bay would continue the forest survey/inventory to determine the size, type, and quality of NSB Kings Bay forest resources. NSB Kings Bay would have completed a forest survey by January 2008 and would update the survey every 10 years.

Baseline:

The installation, in coordination with NAVFAC SE, would update the FMIS to serve as the baseline for all existing forest stands. Other baseline sources include the UMAM for forested wetlands and exotic species surveys.

Monitoring:

The focus of prescribed burn activities on the installation would be for stand improvements for wildlife habitat and timber. Many stands on the installation would be managed for commercial harvest while others would be managed for game and non-game wildlife habitat. Ideal or target vegetative community structure would vary for each management purpose. Target structure for wildlife habitat would include hardwoods with surrounding pine species while commercial would include the removal of hardwoods and a canopy of pine. Each would maintain an herbaceous layer, and no significant woody under- or mid-story.

NSB Kings Bay would monitor for herbaceous plant species appropriate to the target vegetative community and management focus. Species that NSB Kings Bay would monitor include the gopher tortoise in certain areas, white-tailed deer, wild turkey, northern bobwhite quail and various Neotropical Bird Species (see Section 4.3.2).

Hours:	Estimated NSB Kings Bay staff hours = 200 to 450 per year
Budget/Funding Source:	Class III – Recurring, Agriculture Outlease or Forest Reserves
Assessment Level:	Level 1
Type:	Mandatory/Recurring
Legal Driver(s):	32 CFR 190 App B.3.a "Lands and waters suitable for management of fish and wildlife resources shall be managed to conserve wildlife resources for the benefit of the public."
Related Legal:	16 USC 670 a-f DOD INST 4715.3.D.2.n & F.2.b (3) "Fire is an integral element of natural processes. All DoD Components shall manage fire in a manner to preserve health and safety, protect facilities, and facilitate the health and maintenance of natural systems."
Accomplishments:	Prescribed burns and mechanical removal of potential fuels have been performed at NSB Kings Bay on a regular basis. 1,500 acres were prescribed burned in 2008. The US Forest Service performed burns on the installation in 2011 and 2012. Beginning in 2013, the Navy began executing cooperative agreements with the Georgia Forestry Commission (GFC) to prescribe burn and perform mechanical fuel manipulation and road work. The following acreages have been addressed: 2013: 700 acres 2014: 800 acres 2015: 400 acres 2016-18: 1,000 acres

Project No. 3: Pine Planting to Support the Gopher Tortoise Candidate Conservation Agreement

Cost: FY20: $28,400 and recurring every other year at a 2.0% annual inflation rate.

Purpose: Re-establishment of longleaf pines at NSB Kings Bay.

Goals and Objectives: Goal 2, Objective 2.1 – Removal of Nuisance Plants and Wildlife Animals and Diseases

Goal 2, Objective 2.2 – Wetland Enhancement

Goal 2, Objective 2.3 – Floodplain Enhancement

Goal 3, Objective 3.1 – Site Preparation

Goal 3, Objective 3.2 – Habitat Enhancement

Goal 3, Objective 3.3 – Game Species Habitat Enhancement

Location: Pine planting would be completed in suitable recently harvested and site prepared pine plantations and pine flatwoods. Forest thinning, harvesting, and re-planting activities occur installation-wide.

Description: This project will develop and expand the longleaf pine-wiregrass ecosystem in accordance with INRMP goals and objective and the regional Longleaf Pine Initiative. This project consists of forestry site preparation and the purchase and planting of containerized tree seedlings for reforestation. Stands degraded due to storm, insects, disease, damage, or removed for mission related activities and silvicultural reasons will be reforested utilizing the best available science as required by the Sikes Act. Reforested stands planted to longleaf pine benefit the gopher tortoise and eastern indigo snake by restoring their favored habitat. Benefits could also extend to the federally-petitioned eastern diamondback rattlesnake, southern hognose snake, and gopher frog. Forested areas will also benefit ecosystem management by filtering runoff and improving water quality and soil stability. This project can be used by the Navy, USFWS, and other Cooperative Conservation Agreement (CCA) partners to manage the gopher tortoise and possibly preclude the need to list it in Georgia under the ESA.

Baseline: The installation, in coordination with NAVFAC SE, would update the FMIS to serve as the baseline for all existing forest stands. Other baseline sources include the UMAM for forested wetlands and exotic species surveys.

Monitoring: Many stands on the installation are managed for commercial harvest while others are managed for game and non-game wildlife habitat.

	Ideal or target vegetative community structure would vary for each management purpose. NSB Kings Bay would monitor for herbaceous plant species appropriate to the target vegetative community and management focus. Species that NSB Kings Bay would monitor include the gopher tortoise, federally-listed fauna, deer, turkey, quail and various neotropical bird species.
Hours:	Estimated NSB Kings Bay staff hours = 200 to 450 per year
Budget/Funding Source:	Class III – Recurring, Agriculture Outlease or Forest Reserves
Assessment Level:	Level 1
Type:	Mandatory/Recurring
Legal Driver(s):	32 CFR 190 App B.3.a "Lands and waters suitable for management of fish and wildlife resources shall be managed to conserve wildlife resources for the benefit of the public."
Related Legal:	16 USC 670 a-f
Accomplishments:	In 2009, $35,000 was spent on site preparation and planting longleaf pines. In 2011 and 2012, a total of $51,000 was spent to reforest 48 acres.

Project No. 4: Listed and Species-at-Risk Species Monitoring to Support Mission Activities

Cost: FY20: $49,440 with a 2% annual inflation rate.

Purpose: To monitor the health and population of all rare, threatened, and endangered plant and animal species present on the installation in order to make additional management recommendations (such as habitat modifications), if necessary.

Goal and Objective: Goal 3, Objective 3.1 – Viability of Biological Communities

Goal 3, Objective 3.2 – Monitoring for Threatened and Endangered Species

Location: Installation-wide

Description: Surveys/inventories would analyze the health and numbers of species and would assist with the identification of wildlife indicators throughout the installation. The projects will be completed in accordance with the cooperative agreement between the DoN and the GDNR.

Baseline: None

Monitoring: The entire project is to monitor the health and population of rare, threatened and endangered species (*i.e.*, protected plant species, gopher tortoise, least tern, wood stork, and eastern indigo snake) to ensure that appropriate management practices are established. The success of these species is largely dependent upon human activities. Prescribed burns and forest stand thinnings should help maintain gopher tortoise populations and other conservation priorities on NSB Kings Bay (see Projects No. 2 and 15).

Hours: The 5-year interval survey would use contract personnel and require approximately 60 hours of NSB Kings Bay staff time and/or cooperating personnel. The annual monitoring survey for least terns, gopher tortoises, and other conservation priorities will require an estimated 50 hours of NSB Kings Bay staff time.

Budget/Funding Source: Class I – Recurring

Assessment Level: Level 1

Type: Mandatory/Recurring

Legal Driver(s): 16 USC 1536 (a) (2) "Each Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency… is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of (critical habitat) of such species."

EO 13186 "Each Federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations is directed to develop and implement, within 2 years, a Memorandum of Understanding (MOU) with the Fish and Wildlife Service (Service) that shall promote the conservation of migratory bird populations."

Related Legal: OPNAV M-5090.1D, 12-3.7, 16 USC 670 a-f

DoD INST 4715.3.D.2.c "Biologically or geographically significant or sensitive natural resources or species shall be inventoried and managed to protect these resources and to promote biodiversity."

Endangered Species Act, 16 U.S.C. 35, 32 CFR 190

Accomplishments: Several rare, threatened, and endangered species surveys were carried out at NSB Kings Bay between 2004 and 2018, although they were not funded directly by this project. Those resulted in reports about migratory birds[3,4,5], wood storks[6,7], bottlenose dolphins[8,9] , manatees[10,11,12], sea turtles[13], Eastern indigo snakes[14,15], and gopher tortoises[16,17] on the installation.
This project has also funded several recent studies to build upon these data. Comprehensive gopher tortoise surveys were conducted

[3] Forsythe, D.M. 2005. Winter Bird Communities at Sub Base Kings Bay, GA, November 2004-February 2005. April 20, 2005.

[4] Burst, T. and R. Fleming. 2005. Neotropical Migratory Bird Survey Navy Submarine Base Kings Bay, Georgia, 2005.

[5] Science Applications International Corporation (SAIC). 2008. Naval Submarine Base Kings Bay, Aquatic Bird Presence and Habitat Use, Winter 2007, Field Survey Report. December 2008.

[6] Bryan, Jr., A.L., F.C. Depkin. 2009. Wood Stork Use of the Kings Bay Submarine Base in 2008 and 2009. September 30, 2009.

[7] Bryan, Jr., A.L., W.L. Stephens, W.B. Brooks. 2007. Determination of Wood Stork Colony Breeding Success on Kings Bay Naval Submarine Base and other Georgia Colonies. February 12, 2007.

[8] SAIC. 2006. Naval Submarine Base Kings Bay. Determining the Density of Bottlenose Dolphins (*Tursiops truncatus*), Field Survey Report. September 30, 2006.

[9] SAIC. 2009. Naval Submarine Base Kings Bay. Determining the Density of Bottlenose Dolphins (*Tursiops truncates*) in the Vicinity of Naval Submarine Base Kings Bay Georgia. Field Survey Report. January 2009.

[10] Fonnesbeck, C.2009. 2006-2007 Kings Bay Manatee Survey: Preliminary Results. October 22, 2009.

[11] George, C. 2007. Final Report to Southern Division, Naval Facilities Engineering Command. An Assessment of the Use of Helicopters to Survey Manatees at Kings Bay Naval Submarine Base and Surrounding Waters. March 20, 2007.

[12] George, C. 2008. Final Performance Report. Grant No.: 1902-4315. Manatee Study at Naval Submarine Base Kings Bay, Georgia. March 17, 2008.

[13] SAIC. 2005. Presence of Marine Mammals and Sea Turtles in Waters at Naval Submarine Base Kings Bay. Field Survey Report. September 30, 2005.

[14] Naval Submarine Base Kings Bay. 2006. Final. Eastern Indigo Snake Survey Report. Naval Submarine Base Kings Bay , Kings Bay, Camden County, GA. May 2006.

[15] SAIC. 2006. Indigo Snake Survey, Kings Bay Naval Submarine Base. March 10, 2006.

[16] Department of the Navy, Southern Division. 2004. Invasive and Rare Plant Survey and Distribution Status of the Gopher Tortoise (*Gopherus polyphemus*) at Kings Bay Naval Submarine Base, Kings Bay, Georgia. Final. Contract No. N62467-00-D-0320. September 2004.

[17] SAIC. 2008. Naval Submarine Base Kings Bay. Gopher Tortoise Relocation Survey. Field Survey Report. February 2008.

in 2008 and 2014 to document the locations of active and inactive tortoise burrows, estimate the population size, and determine preferred habitats of gopher tortoises relative to management activities occurring on the installation[18,19]. Vertebrate associates of gopher tortoise burrows were monitored with remote wildlife cameras in 2015-16[20]. Winter and summer bird surveys were funded in 2010[21] and 2011[22] to provide abundance and diversity data for general comparison to the existing historical bird data (upland and aquatic species) and to specifically note occurrences of rare and listed species. A new survey of wading birds was funded in 2018 and is underway. Herpetofauna, bat, and nocturnal bird surveys were conducted in 2017[23].

[18] Tuberville, T., S. Schweitzer, and L. Bryan. 2009. Gopher Tortoise Survey of Kings Bay Naval Submarine Base, Georgia. Contract No. N69450-08-RP-00012. Final Report. May 20, 2009.

[19] Tuberville, T., N. White, L. Brown, and S. Wilde, 2014, Gopher Tortoise Survey of the Kings Bay Naval Submarine Base, Georgia, University of Georgia, Warnell School of Forestry and Natural Resources.

[20] Brown, M. K. and T.D. Tuberville, 2018, Vertebrate Associates of Gopher Tortoise Burrows Monitored with Remote Wildlife Cameras at Kings Bay Naval Submarine Base, Georgia, University of Georgia's Savannah River Ecology Laboratory, University of Georgia, Aiken, South Carolina.

[21] Depkin, F.C., A.L. Bryan, Jr., and S.B. Wilde. 2011. Kings Bay Rare, Threatened, and Endangered Wildlife Surveys: Avifauna 2010/2011. October 13, 2011.

[22] Bryan, Jr., A.L., F.C. Depkin, and S.B. Wilde. 2012. Kings Bay Rare, Threatened, and Endangered Wildlife Surveys: Aquatic Avifauna and Marsh Hammocks 2011/2012. November 30, 2012.

[23] White, K.N., T.D. Tuberville, and L.A. Bryan, 2018, Reptile and Amphibian Surveys at the Naval Submarine Base, Kings Bay, Georgia, Prepared for Naval Submarine Base Kings Bay, Prepared by University of Georgia's Savannah River Ecology Laboratory, Aiken, South Carolina.

Project No. 5: Habitat Improvement Through Forest Management

Cost: FY20: $39,500 with a 2% annual inflation rate.

Purpose: To improve habitat for RTE species, particularly gopher tortoises and indigo snakes, primarily through prescribed burns.

Goal and Objective: Goal 3, Objective 3.1 – Viability of Biological Communities

Goal 3, Objective 3.2 – Monitoring for Threatened and Endangered Species

Location: The study will focus on the portions of NSB Kings Bay where suitable habitat for the gopher tortoise and indigo snake occurs.

Description: NSB Kings Bay will contract the survey and management recommendations updated periodically. NSB Kings Bay staff will be involved with habitat management annually.

Baseline: None

Monitoring: Surveys will be conducted in conjunction with habitat improvement activities to ensure effectiveness of the project.

Hours: Monitoring will be contracted: NSB Kings Bay staff = 40 hours

Assessment Level: Level 1

Type: Mandatory

Legal Driver(s): 16 USC 1536 (a) (2) "Each Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency… is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of (critical habitat) of such species."

16 USC 670 a-f, 16 USC 1531 (c) (1)

16 USC 1536 (a) (1) " All other Federal agencies shall, in consultation with and with the assistance of the Secretary, utilize their authorities in furtherance of the purposes of this chapter by carrying out programs for the conservation of endangered species and threatened species listed pursuant to section 1533 of this title."

Related Legal: OPNAV M-5090.1D, 12-3.7, 16 USC 670 a-f

DoD INST 4715.3.D.2.c "Biologically or geographically significant or sensitive natural resources or species shall be inventoried and managed to protect these resources and to promote biodiversity."

Endangered Species Act, 16 U.S.C. 35, 32 CFR 190

Accomplishments: This project originated as a means to improve general habitat conditions at NSB Kings Bay for rare and listed species. Since 2011, funds provided for this project have been combined with forestry funds (Projects 2 and 3) to improve forest habitat on the installation.

2005: Crab Island field survey report
2005: Fish presence and habitat use, SUBASE Kings Bay
2005: Shorebird / sea bird presence and habitat use
2005: SUBASE Kings Bay terrestrial species survey report
2005: Loggerhead turtle inter-nesting habitat use and post-nesting movements in Georgia
2005: On-water physical surveys SUBASE Kings Bay
2005: Crab Island survey
2006: Hydrodynamics study SUBASE Kings Bay
2008: Terrestrial survey SUBASE Kings Bay
2008: Aquatic bird presence and habitat use SUBASE Kings Bay, Georgia

Project No. 6: Shortnose and Atlantic Sturgeon Abundance and Distribution Monitoring

Cost: Not a recurring project, so cost estimates are not pre-programmed.

Purpose: Gather data about the spatial and temporal distribution of shortnose sturgeon and Atlantic sturgeon in the lower St. Marys Estuary, particularly in the vicinity of NSB Kings Bay and the maintained submarine channel.

Goal and Objective: Goal 3, Objective 3.1 – Viability of Biological Communities

Goal 3, Objective 3.2 – Monitoring for Threatened and Endangered Species

Location: Cumberland Sound and the lower St Marys River.

Description: The project utilizes established protocols to survey Atlantic and shortnose sturgeons. Information will be gathered about sturgeon movements, seasonality and duration of occurrence, population demographics, and identification of individuals and their freshwater origins.

Baseline: 2013-16 Report.

Monitoring: Final reports and databases will be provided at the conclusion of each survey.

Hours: Monitoring will be contracted: NSB Kings Bay staff = 40 hours

Assessment Level: Level 1

Type: Mandatory

Legal Driver(s): 16 USC 1536 (a) (2) "Each Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency… is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of (critical habitat) of such species."

16 USC 670 a-f, 16 USC 1531 (c) (1)

16 USC 1536 (a) (1) "All other Federal agencies shall, in consultation with and with the assistance of the Secretary, utilize their authorities in furtherance of the purposes of this chapter by carrying out programs for the conservation of endangered species and threatened species listed pursuant to section 1533 of this title."

Related Legal: DoD INST 4715.3.D.2.c "Biologically or geographically significant or sensitive natural resources or species shall be inventoried and managed to protect these resources and to promote biodiversity."

Accomplishments: The University of Georgia, in 2014-15, completed spatial and temporal distribution surveys for shortnose sturgeon and Atlantic sturgeon in the lower St. Mary's River through the use of telemetry tags.[24]

[24] Fox, A.G. and D.L. Peterson. 2017. Occurrence and movements of Atlantic and shortnose sturgeon in Cumberland Sound and the St. Marys River, Georgia. Prepared for the United States Navy. Prepared by the University of Georgia, Athens, Georgia.

Project No. 7: INRMP Review and Revision

Cost:	FY20: $8,300 with a 2% annual inflation rate. Additional funds may be requested every 5-years.
Purpose:	To update and revise the INRMP annually.
Goal and Objective:	Goal 1, Objective 1.2 – Training and Education Goal 1, Objective 1.2 – Citizen Participation Goal 3, Objective3.2 – Habitat Enhancement
Location:	Installation-wide.
Description:	NSB Kings Bay would update, and revise as appropriate, the INRMP on an annual basis. This review and update includes updating progress on plans and projects, and revisions to the INRMP goals and objectives, if necessary. The INRMP would be re-signed by the Sikes Act conservation partners every 5 years.
Baseline:	Previous-year INRMPs.
Monitoring:	None.
Hours:	NSB Kings Bay staff = 80 hours annually; NAVFAC SE and cooperating agency participation would be required annually.
Program/Budget:	Class I - recurring
Assessment Level:	Level 1
Type:	Mandatory/Recurring
Legal Driver(s):	Sikes Act Improvement Amendment
Related Legal:	None
Accomplishments:	This INRMP was last updated in 2018, and is scheduled to be updated every year to ensure it conveys a benefit to new listed species and their habitats. Additional funds are allocated every five years to ensure more comprehensive updates in accordance with OSD instructions and to ensure it is properly reviewed for operation and effect.

Project No. 8: Manatee Population Monitoring

Cost: FY20: $27,450 with a 2% annual inflation rate.

Purpose: To monitor the manatee population and habitat use at NSB Kings Bay.

Goal and Objective: Goal 1, Objective 1.2 – Training and Education

Goal 1, Objective 1.2 – Citizen Participation

Goal 3, Objective 3.1 – Viability of Biological Communities

Goal 3, Objective 3.2 – Protect Threatened and Endangered Species

Location: Installation-wide operations would resume taking photographs of all manatees and submitting them to GDNR to include in the manatee photo database if possible. Provide assistance for the helicopter surveys for 3 years and to fund 1 month of salary for a GDNR employee to maintain the long-term database of manatee sightings and photos.

Baseline: None.

Monitoring: Monitoring the manatee individuals and habitat usage.

Hours: Cooperating agency staff and contractor would conduct monitoring; NSB Kings Bay staff = 80 hours annually.

Program/Budget: To be provided later.

Assessment Level: Level 5

Type: Stewardship

Legal Driver(s): 16 USC 1536 (a) (2) "Each Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency… is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of (critical habitat) of such species."

Related Legal: Endangered Species Act, 16 U.S.C. 35, 32 CFR 190

Marine Mammal Protection Act, 16 USC 1361-1407

Accomplishments: On-water manatee surveys were completed at NSB Kings Bay in 2005. From 2006 to 2013, the Navy provided GDNR with funds to conduct manatee aerial surveys over waters surrounding NSB Kings Bay to document inter- and intra-annual manatee abundance and collect photo-identification data. From 2014-18, GDNR has used satellite telemetry and health assessments in cooperation with the Navy and other partners to document fine-scale movement of manatees within and around NSB Kings Bay, investigate migratory

movements, behavior and habitat use of manatees as they disperse throughout coastal Georgia, and assess health of captured manatees[25].

[25] George, R.C., 2018, Manatee Study at Naval Submarine Base Kings Bay, Georgia, Prepared by Georgia Department of Natural Resources, Wildlife Resources Division.

Project No. 9: Shoreline and Riparian Conservation

Cost:	Not a recurring project, so cost estimates are not pre-programmed.
Purpose:	Protect approximately 700 feet of the waterfront.
Goals and Objectives:	Goal 2, Objective 2.1 – Wetland Protection Goal 2, Objective 2.2 – Stormwater Pollution Prevention Goal 2, Objective 2.2 – Long-Term Erosion Control Measures Goal 3, Objective 3.1 – BMPs - Water Quality Goal 3, Objective 3.2 – Habitat Protection Goal 3, Objective 3.3 – Game Species Habitat Protection
Location:	Provide shoreline protection at one location along the operational waterfront and port services area.
Description:	Install and maintain shoreline vegetation at appropriate locations along the waterfront to prevent erosion and habitat degradation that could adversely affect manatees, sturgeons, and other protected resources.
Baseline:	None.
Monitoring:	None.
Hours:	This project would be conducted by a contractor.
Budget/Funding Source:	Class III– Recurring until project impacts installation wetlands at which time the project becomes Class I. Funding sources include Station O&M(N).
Assessment Level:	Level 2
Type:	Mandatory
Legal Driver(s):	32 CFR 190 (App. B.1.a) " DoD lands shall be managed to control erosion" EO 13148, Sec. 202 Environmental Compliance "Each agency shall comply with environmental regulations by establishing and implementing environmental compliance audit programs and policies that emphasize pollution prevention as a means to both achieve and
Related Legal:	16 USC 670 a-f
Accomplishments:	This project would be funded as needed to maintain the rip rap waterfront to conserve shoreline habitat for species of conservation needs. Past accomplishments include a 2004 wetlands delineation and a 2005 palustrine/emergent wetlands survey.

Project No. 10: Feral, Free Ranging, and Invasive Animal Control

Cost: FY20: $28,000 with a 2% annual inflation rate.

Purpose: Control and eradicate feral, free-ranging, and invasive animals at NSB Kings Bay for the conservation of protected resources.

Goals and Objectives: Goal 3, Objective 3.1 – Viability of Biological Communities

Goal 3, Objective 3.2 – Monitoring for Threatened and Endangered Species

Location: Installation-wide.

Description: This project will fund USDA Wildlife Services personnel to exercise animal damage management and control at NSB Kings Bay. These species include feral cats and dogs, coyotes, Canada geese, armadillos, and wild pigs. Wildlife Services is staffed, equipped, and permitted to handle any animal control issue. Through this project, personnel will survey the base bi-weekly and on request to monitor populations and carry out control methodologies as needed. With respect to feral cats and dogs, Wildlife Services will live trap the animals and transport them to the local animal shelter. All actions shall meet requirements of the Armed Forces Pest Management Board Technical Guide No. 37, Integrated Management of Stray Animals on Military Installations.

This project improves and protects the native habitats that support the federally-threatened Eastern indigo snake and wood stork, as outlined in the installation INRMP. Candidate and petitioned species, such as the gopher tortoise, striped newt, eastern diamondback rattlesnake, southern hognose snake, and gopher frog will benefit from increased ecosystem health created by the removal of damage causing species. For example, wild pigs and armadillos can damage or destroy gopher tortoise burrows and eggs.

Baseline: Observations and records of habitat and gopher tortoise burrow damage.

Monitoring: Regular observations of sensitive habitats and trouble spots on the installation.

Hours: Cooperating agency staff and contractor would conduct monitoring; NSB Kings Bay staff = 80 hours annually.

Budget/Funding Source: Class I – Recurring

Assessment Level: Level 1

Type: Mandatory/Recurring

Legal Driver(s):	16 USC 1536 (a) (2) "Each Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency… is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of (critical habitat) of such species." EO 13186 "Each Federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations is directed to develop and implement, within 2 years, a Memorandum of Understanding (MOU) with the Fish and Wildlife Service (Service) that shall promote the conservation of migratory bird populations."
Related Legal:	OPNAV M-5090.1D, 12-3.7, 16 USC 670 a-f DoD INST 4715.3.D.2.c "Biologically or geographically significant or sensitive natural resources or species shall be inventoried and managed to protect these resources and to promote biodiversity." Endangered Species Act, 16 U.S.C. 35, 32 CFR 190
Accomplishments:	Since 2015, the Navy has annually contracted USDA APHIS Wildlife Services to perform this project at NSB Kings Bay.

7 Functional Areas and Management Focus

This section presents the functional areas of NSB Kings Bay and the focus of natural resources management in each functional area. This section also discusses other management practices that will occur within the functional area. Tables are provided that show the goals, objectives, and strategies that will be achieved through implementation of the resource management focus in each functional area on the installation.

Functional areas are established in the plan to acknowledge the use of the area for its military purpose and for considering the opportunities to achieve natural resources management goals and objectives. Forestry activities occur in all of the functional areas. In classifying a functional area, it is recognized that existing facilities and activities on the land are largely fixed. Property at an installation can be classified into one or more of the following functional areas.

- *Protected Areas (P)* - This classification includes land protected due to the unique natural, cultural, or aesthetic value. Examples include rare geologic features, significant historical sites, natural heritage sites, threatened and endangered species habitat, unique high-value recreation areas, and exemplary natural communities.
- *Operational Protected Areas (OP)* - This classification includes areas vital to continuing the military mission. Examples include developed/built areas, dredge spoil sites, high-security restricted areas, and industrial support areas.
- *Mixed-Use Management Areas (MU)* - Lands where low- or moderate-intensity military uses occur in areas that are in natural condition, contain valued natural features, and have the potential to yield significant natural resources-based benefits through effective management practices. Consistent with the military mission, non-timber values such as wildlife habitat, water quality, recreational potential, and urban forestry are the basis for management decisions. Examples include streamside management zones, cypress domes and ponds, fresh water fisheries, shoreline habitat for established conservation priorities, and grounds maintenance.
- *Timber/Agricultural areas (T/A)* - This classification includes land where timber management is the primary objective and includes areas designated for commercial harvesting. However, within each area, the management intensity will be considered against factors such as regulations, economic and wildlife considerations, slope stability concerns, soils,

inaccessibility, aesthetics, and productivity. Examples include bottomland hardwood forests, upland forests, wildlife corridors, and stands with extended rotation ages.

The seven functional areas at NSB Kings Bay are: MU-1, MU-2, OP-1, OP-2, OP-3, P-1 and P-2 (Figure 7-1).

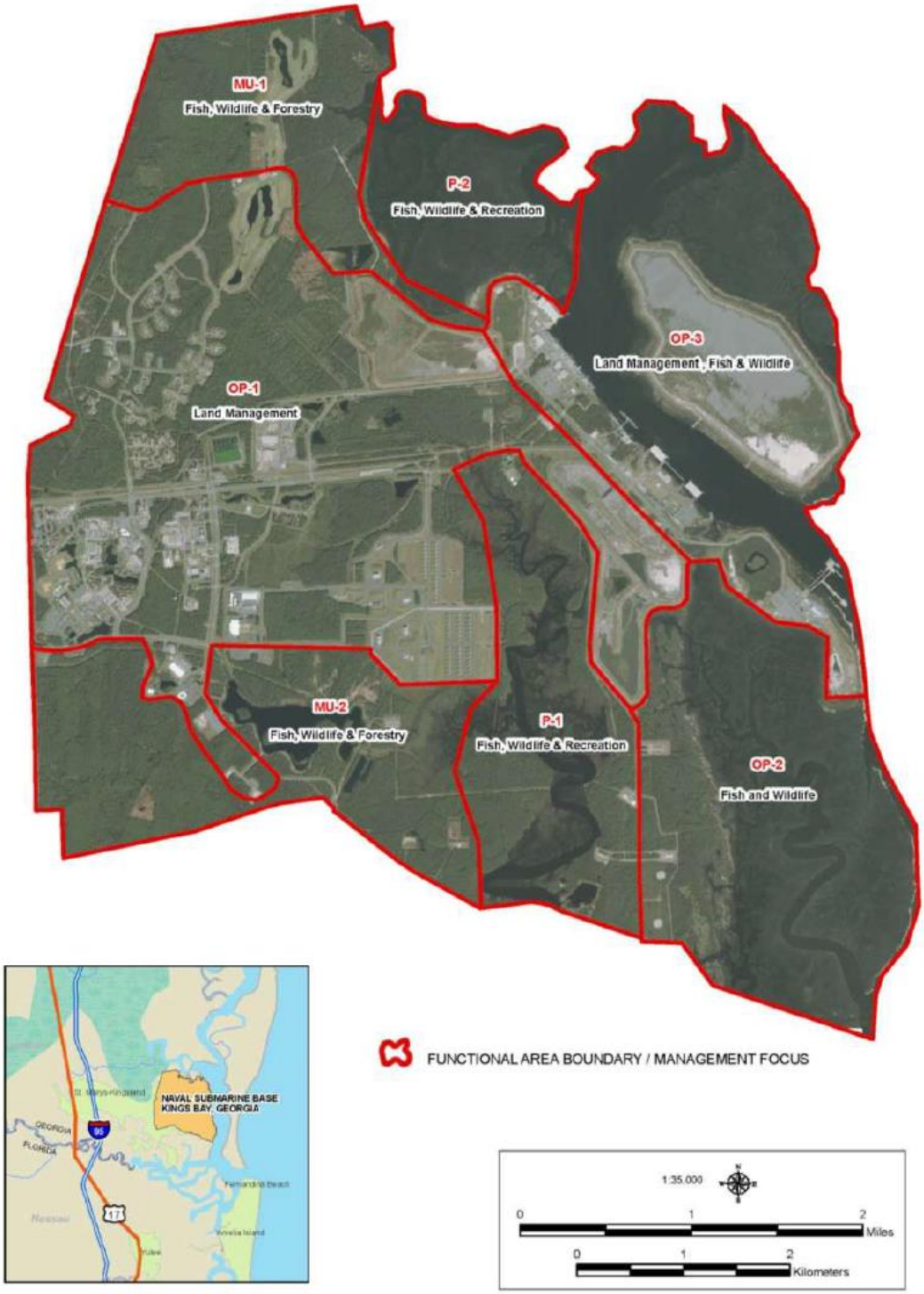

Figure 7-1. Functional Areas.

7.1 Mixed-Use (MU-1) Management Area 1

The MU-1 area is located in the northwestern corner of the installation (Figure 7-1). The area is functionally classified MU because of its undeveloped condition and use as a solar array field. Notable natural features include timber stands (*e.g.*, longleaf and slash pines interspersed with hardwoods), aquatic resources (*e.g.*, freshwater ponds, salt marsh and creek), and suitability for outdoor recreation uses. Recreation activities within the MU-1 area include fishing and hunting, hiking, and picnicking. The MU-1 area is open to public access. Table 7-1 presents the natural resources management goals, objectives, and strategies (see Section 4.1) to be achieved from the management focuses identified within the MU-1 area.

Table 7-1. Natural Resources Management Goals, Objectives, and Strategies for the MU-1 Area.

Goals	Objectives	Strategies
1	1.2	NSB Kings Bay would maintain an ecosystem management awareness and training/education program available to all interested NSB Kings Bay personnel.
1	1.2	NSB Kings Bay would participate in regional stewardship/research programs that foster citizen participation in ecosystem education and stewardship.
2	2.1	NSB Kings Bay would continue to monitor the health and populations of game and non-game species to ensure that wildlife do not become a nuisance to the installation or to the surrounding region.
2	2.2	NSB Kings Bay would maintain a long-term management plan to protect and conserve the natural functions of wetlands and shoreline areas, including limiting wetland shoreline destruction and reducing adverse impacts to water quality.
2	2.4	NSB Kings Bay would increase the number of natural areas on the installation as opportunities arise and would utilize native species for new landscaping.
3	3.1	NSB Kings Bay would continue existing timber stand and wildlife habitat improvement practices using prescribed burns and thinnings to achieve individual stand objectives, including the enhancement of habitat, maximizing sustained yield, enhancing multiple use management, reducing the potential for wildfires, and controlling diseases and insect pests.
3	3.1	NSB Kings Bay would continue to establish and implement specific BMPs for the protection of water quality on all NSB Kings Bay (*e.g.*, wetlands, salt marsh and freshwater ponds) and surrounding water bodies (*e.g.*, Kings Bay and Cumberland Sound).
3	3.2	NSB Kings Bay would continue to update surveys for Neotropical Migratory Bird and Rare, Threatened, and Endangered Species.
3	3.2	NSB Kings Bay would continue to implement programs and activities for the protection and enhancement of all habitat for animal and plant species.

Table 7-1, continued.

Goals	Objectives	Strategies
3	3.3	NSB Kings Bay would continue to implement appropriate monitoring and training strategies to ensure the provision of healthy sustainable game wildlife populations.
3	3.3	NSB Kings Bay would continue to implement programs and activities for the enhancement of habitat for fish and game species.
3	3.4	NSB Kings Bay would continue to implement appropriate measures to protect water quality of installation fishery resources.
3	3.4	NSB Kings Bay would effectively harvest, monitor, and stock fish populations to ensure healthy sustainable fish populations.
4	4.1	NSB Kings Bay would continue the recreation planning board that addresses means for providing recreational activities. Membership on the recreation board would consist of, at a minimum, the Natural Resources Manager, a member of the Facilities Review Board and the Director of MWR. NSB Kings Bay would also consider utilizing a NPS representative to review the findings of the analysis.

7.2 Operational Protected (OP-1) Management Area

The OP-1 area is the largest functional area on NSB Kings Bay (Figure 7-1). The area encompassing OP-1 is a designated operational protected area because this is where most of the inland military mission and family support facilities and activities are located. Much of this area is developed to moderate and high extent. Although the function of the area is for operations, the area contains freshwater ponds, wetlands, and forest stands. Table 7-2 presents the natural resources management goals, objectives, and strategies (see Section 4.1) to be achieved from the management focuses identified in the OP-1 area.

Table 7-2. Natural Resources Management Goals, Objectives, and Strategies for the OP-1 Area.

Goals	Objectives	Strategies
1	1.2	NSB Kings Bay would maintain an ecosystem management awareness and training/education program available to all interested NSB Kings Bay personnel.
1	1.2	NSB Kings Bay would participate in regional stewardship/research programs that foster citizen participation in ecosystem education and stewardship
2	2.1	NSB Kings Bay has a number of pests and exotic species (*e.g.*, fire ants, mole crickets, aphids, and mosquitoes) that occur on the installation, and the control of these pests and exotics is an integral ecosystem management practice on NSB Kings Bay.
2	2.1	NSB Kings Bay would continue to monitor the health and populations of game and non-game species to ensure that wildlife do not become a nuisance to the installation or to the surrounding region.
2	2.2	NSB Kings Bay would maintain a long-term management plan to protect and conserve the natural functions of wetlands and shoreline areas, including limiting wetland shoreline destruction and reducing adverse impacts to water quality.

Table 7-2, continued.

Goals	Objectives	Strategies
2	2.2	NSB Kings Bay would continue to evaluate its stormwater management program and activities contributing to stormwater runoff and/or pollutant loading in stormwater runoff.
2	2.2	NSB Kings Bay would continue to evaluate its soil erosion control management program and would reduce the rate of soil erosion through the implementation of long-term measures and projects.
2	2.2	NSB Kings Bay would inventory its use of pesticides and fertilizers, assessing alternatives to and a reduction in pesticide and fertilizer use. The intent is to reduce chemical pesticide and fertilizer use to help protect water quality.
2	2.3	NSB Kings Bay would be review proposed activities for impact avoidance to the attenuation capacity of the 100-year floodplain. If it is determined that development is necessary within the 100-year floodplain to support the military mission, development shall be first located in the previously disturbed areas of the floodplain.
2	2.4	NSB Kings Bay would increase the number of natural areas on the installation as opportunities arise and would utilize native species for new landscaping.
2	2.5	NSB Kings Bay would update policies to minimize adverse impacts to ecosystem resources from land disturbance activities (*e.g.*, clearing, training).
3	3.2	NSB Kings Bay would continue existing timber stand and wildlife habitat improvement practices using prescribed burns and thinnings to achieve individual stand objectives, including the enhancement of habitat, maximizing sustained yield, enhancing multiple use management, reducing the potential for wildfires, and controlling diseases and insect pests.
3	3.4	NSB Kings Bay would implement appropriate measures to protect water quality of installation fishery resources.
3	3.4	NSB Kings Bay would effectively harvest, monitor, and stock fish populations to ensure healthy sustainable fish populations.
4	4.1	NSB Kings Bay would continue the recreation planning board that addresses means for providing recreational activities. Membership on the recreation board would consist of, at a minimum, the Natural Resources Manager, a member of the Facilities Review Board and the Director of MWR. NSB Kings Bay would also consider utilizing a NPS representative to review the findings of the analysis.
4	4.2	NSB Kings Bay would develop recreational trails and/or interpretive centers in areas of the NSB Kings Bay with unique cultural, natural, historical, or archeological resources.

7.3 Mixed-Use (MU-2) Management Area

The MU-2 functional area is located in the southwest corner of the installation (Figure 7-1). The area is functionally classified MU because of its undeveloped condition and low intensity use by the Navy. Notable natural features include timber stands, wetlands, and suitability for outdoor recreation purposes. Recreation activities include fishing and hunting, non-motorized boating, hiking, camping, and picnicking. A dominant feature of the MU-2 area is Lake D, which is the largest water body on the installation and provides excellent habitat for the painted bunting, waterfowl, and wading

birds. Table 7-3 presents the natural resources management goals, objectives, and strategies (see Section 4.1) to be achieved from the management focuses identified within the MU-2 area.

Table 7-3. Natural Resources Management Goals, Objectives, and Strategies for the MU-2 Area.

Goals	Objectives	Strategies
1	1.2	NSB Kings Bay would maintain an ecosystem management awareness and training/education program available to all interested NSB Kings Bay personnel.
1	1.2	NSB Kings Bay would continue to participate in regional stewardship/research programs that foster citizen participation in ecosystem education and stewardship.
2	2.1	NSB Kings Bay would continue to monitor the health and populations of game and non-game species to ensure that wildlife do not become a nuisance to the installation or to the surrounding region.
2	2.2	NSB Kings Bay would maintain and update a long-term management plan to protect and conserve the natural functions of wetlands and shoreline areas, including limiting wetland shoreline destruction and reducing adverse impacts to water quality.
2	2.4	NSB Kings Bay would increase the number of natural areas on the installation as opportunities arise and would utilize native species for new landscaping.
3	3.1	NSB Kings Bay would continue existing timber stand and wildlife stand improvement practices using prescribed burns and thinnings to achieve individual stand objectives, including the enhancement of habitat maximizing sustained yield, enhancing multiple use management, reducing the potential for wildfires, and controlling diseases and insect pests.
3	3.1	NSB Kings Bay would continue to establish and implement specific BMPs for the protection of water quality on all NSB Kings Bay (*e.g.*, wetlands, salt marsh and freshwater ponds) and surrounding water bodies (*e.g.*, Kings Bay and Cumberland Sound).
3	3.2	NSB Kings Bay would continue to update surveys for Neotropical Migratory Bird and Rare, Threatened, and Endangered Species.
3	3.2	NSB Kings Bay would continue to implement programs and activities for the protection and enhancement of all habitat for animal and plant species.
3	3.3	NSB Kings Bay would continue to implement appropriate monitoring and training strategies to ensure the provision of healthy sustainable game wildlife populations.
3	3.3	NSB Kings Bay would continue to implement programs and activities for the enhancement of habitat for fish and game species.
3	3.4	NSB Kings Bay would continue to implement appropriate measures to protect water quality of installation fishery resources.
3	3.4	NSB Kings Bay would effectively harvest, monitor, and stock fish populations to ensure healthy sustainable fish populations.
4	4.1	NSB Kings Bay would continue the recreation planning board that addresses means for providing recreational activities. Membership on the recreation board would consist of, at a minimum, the Natural Resources Manager, a member of the Facilities Review Board and the Director of MWR. NSB Kings Bay would also consider utilizing a NPS representative to review the findings of the analysis.

7.4 North River Protected (P-1) Management Area

The P-1 functional area includes the North River and its associated salt marsh (Figure 1). The area is undeveloped and largely undisturbed by human activities. Within this area is the Pagan Creek Salt Marsh mitigation site, which includes abundant and diverse fish and wildlife resources. The P-1 area functions as a unique environmental and ecological resource. Table 7-4 presents the natural resources management goals, objectives, and strategies (see Section 4) to be achieved from the management focuses identified within the P-1 area.

Table 7-4. Natural Resources Management Goals, Objectives, and Strategies for the P-1 Area.

Goals	Objectives	Strategies
1	1.2	NSB Kings Bay would maintain an ecosystem management awareness and training/education program available to all interested NSB Kings Bay personnel.
1	1.2	NSB Kings Bay would participate in regional stewardship/research programs that foster citizen participation in ecosystem education and stewardship.
2	2.1	NSB Kings Bay would continue to monitor the health and populations of game and non-game species to ensure that wildlife do not become a nuisance to the installation or to the surrounding region.
3	3.2	NSB Kings Bay would continue to update surveys for Neotropical Migratory Bird and Rare, Threatened, and Endangered Species.
3	3.4	NSB Kings Bay would continue to implement appropriate measures to protect water quality of installation fishery resources.
3	3.4	NSB Kings Bay would effectively harvest, monitor, and stock fish populations to ensure healthy sustainable fish populations.
4	4.1	NSB Kings Bay would continue the recreation planning board that addresses means for providing recreational activities. Membership on the recreation board would consist of, at a minimum, the Natural Resources Manager, a member of the Facilities Review Board and the Director of MWR. NSB Kings Bay would also consider utilizing a NPS representative to review the findings of the analysis.
4	4.2	NSB Kings Bay would continue to develop recreational trails and/or interpretive centers in areas of the NSB Kings Bay with unique cultural, natural, historical, or archeological resources.

7.5 Operational Protected (OP-2) Management Area

The OP-2 functional area occupies the southeast corner of NSB Kings Bay (Figure 7-1). The area is undeveloped and largely undisturbed by human activities. However, the area is designated as OP because it functions as a high security, munitions storage area for the continuation of the military mission. Mill Creek and its associated salt marshes cover most of the OP-2 surface area, and contain abundant and diverse fish and wildlife resources that are associated with salt marsh ecosystems. The remaining area is mostly hardwood stands with a few low quality pine stands. The area has an abundant white-tailed deer population, as well as wild turkeys, bobcats, foxes, and numerous songbird

species. Table 7-5 presents the natural resources management goals, objectives, and strategies (see Section 4) to be achieved from the management focuses identified in the OP-2 area.

Table 7-5. Natural Resources Management Goals, Objectives, and Strategies for the OP-2 Area.

Goals	Objectives	Strategies
1	1.2	NSB Kings Bay would maintain an ecosystem management awareness and training/education program available to all interested NSB Kings Bay personnel.
1	1.2	NSB Kings Bay would continue to participate in regional stewardship/research programs that foster citizen participation in ecosystem education and stewardship.
2	2.1	NSB Kings Bay would continue to monitor the health and populations of game and non-game species to ensure that wildlife do not become a nuisance to the installation or to the surrounding region.
2	2.2	NSB Kings Bay would maintain a long-term management plan to protect and conserve the natural functions of wetlands and shoreline areas, including limiting wetland shoreline destruction and reducing adverse impacts to water quality.
2	2.4	NSB Kings Bay would continue to increase the number of natural areas on the installation as opportunities arise and would utilize native species for new landscaping.
3	3.1	NSB Kings Bay would continue existing timber stand and wildlife stand improvement practices using prescribed burns and thinnings to achieve individual stand objectives, including the enhancement of habitat maximizing sustained yield, enhancing multiple use management, reducing the potential for wildfires, and controlling diseases and insect pests.
3	3.1	NSB Kings Bay would continue to establish and implement specific BMPs for the protection of water quality on all NSB Kings Bay (*e.g.*, wetlands, salt marsh and freshwater ponds) and surrounding water bodies (*e.g.*, Kings Bay and Cumberland Sound).
3	3.2	NSB Kings Bay would continue to update surveys for Neotropical Migratory Bird and Rare, Threatened, and Endangered Species.
3	3.2	NSB Kings Bay would continue to implement programs and activities for the protection and enhancement of all habitat for animal and plant species.
3	3.3	NSB Kings Bay would continue to implement appropriate monitoring and training strategies to ensure the provision of healthy sustainable game wildlife populations.
3	3.3	NSB Kings Bay would continue to implement programs and activities for the enhancement of habitat for fish and game species.
3	3.4	NSB Kings Bay would continue to implement appropriate measures to protect water quality of installation fishery resources.
3	3.4	NSB Kings Bay would effectively harvest, monitor, and stock fish populations to ensure healthy sustainable fish populations.

7.6 Operational Protected (OP-3) Management Area

Military mission facilities located within the OP-3 functional area include all waterfront operational support areas, all navigational channels and turning basins, and the Crab Island Dredge Spoil area (Figure 7-1). OP-3 includes the area of Kings Bay into Cumberland Sound and bounded by the Marianna Creek marshes to the north and the Mill Creek marshes to the south. Because the function of the area is for operational readiness of the installation, the area is designated as operational protected. Table 7-6 presents the natural resources management goals, objectives, and strategies (see Section 4.1) to be achieved from the management focuses identified in the OP-3 area.

Table 7-6. Natural Resources Management Goals, Objectives, and Strategies for the OP-3 Area.

Goals	Objectives	Strategies
1	1.2	NSB Kings Bay would maintain an ecosystem management awareness and training/education program available to all interested NSB Kings Bay personnel.
1	1.2	NSB Kings Bay would continue to participate in regional stewardship/research programs that foster citizen participation in ecosystem education and stewardship.
2	2.1	NSB Kings Bay has a number of pests and exotic species (*e.g.*, fire ants, mole crickets, aphids, and mosquitoes) that occur on the installation, and the control of these pests and exotics is an integral ecosystem management practice on NSB Kings Bay.
2	2.1	NSB Kings Bay would continue to monitor the health and populations of game and non-game species to ensure that wildlife do not become a nuisance to the installation or to the surrounding region.
2	2.2	NSB Kings Bay would maintain a long-term management plan to protect and conserve the natural functions of wetlands and shoreline areas, including limiting wetland shoreline destruction and reducing adverse impacts to water quality.
2	2.2	NSB Kings Bay would continue to evaluate its stormwater management program and activities contributing to stormwater runoff and/or pollutant loading in stormwater runoff.
2	2.2	NSB Kings Bay would continue to evaluate its soil erosion control management program and would reduce the rate of soil erosion through the implementation of long-term measures and projects.
2	2.2	NSB Kings Bay would inventory its use of pesticides and fertilizers, assessing alternatives to and a reduction in pesticide and fertilizer use. The intent is to reduce chemical pesticide and fertilizer use to help protect water quality.
2	2.3	NSB Kings Bay would be review proposed activities for impact avoidance to the attenuation capacity of the 100-year floodplain. If it is determined that development is necessary within the 100-year floodplain to support the military mission, development shall be first located in the previously disturbed areas of the floodplain.
2	2.4	NSB Kings Bay would increase the number of natural areas on the installation as opportunities arise and would utilize native species for new landscaping.

Table 7-6, continued.

Goals	Objectives	Strategies
2	2.5	NSB Kings Bay would update policies to minimize adverse impacts to ecosystem resources from land disturbance activities (*e.g.*, clearing, training).
3	3.2	NSB Kings Bay would continue to update surveys for Neotropical Migratory Bird and Rare, Threatened, and Endangered Species.
3	3.2	NSB Kings Bay would continue to implement programs and activities for the protection and enhancement of all habitat for animal and plant species.

7.7 Protected (P-2) Management Area

The P-2 functional area includes Marianna Creek and its associated salt marshes (Figure 7-1). The area is undeveloped and largely undisturbed by human activities. The P-2 area functions as a unique environmental and ecological resource. Table 7-7 presents the natural resources management goals, objectives, and strategies (see Section 4.1) to be achieved from the management focuses identified within the P-2 area.

Table 7-7. Natural Resources Management Goals, Objectives, and Strategies for the P-2 Area.

Goals	Objectives	Strategies
1	1.2	NSB Kings Bay would maintain an ecosystem management awareness and training/education program available to all interested NSB Kings Bay personnel.
1	1.2	NSB Kings Bay would continue to participate in regional stewardship/research programs that foster citizen participation in ecosystem education and stewardship.
2	2.1	NSB Kings Bay would continue to monitor the health and populations of game and non-game species to ensure that wildlife do not become a nuisance to the installation or to the surrounding region.
3	3.2	NSB Kings Bay would periodically update surveys for Neotropical Migratory Bird and Rare, Threatened, and Endangered Species.
4	4.1	NSB Kings Bay would continue the recreation planning board that addresses means for providing recreational activities. Membership on the recreation board would consist of, at a minimum, the Natural Resources Manager, a member of the Facilities Review Board and the Director of MWR. NSB Kings Bay would also consider utilizing a NPS representative to review the findings of the
4	4.2	NSB Kings Bay would develop recreational trails and/or interpretive centers in areas of the NSB Kings Bay with unique cultural, natural, historical, or archeological resources.

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B Forest Stand Inventory Data

Table B-1
Forest Stand Inventory Data, Naval Submarine Base Kings Bay, Kings Bay, Georgia

Comp	RU	Acres	Cover Code	Origin Code	O Year	Trees per Acre	DBH (in)	Height (ft)	Basal Area	S VOL	% S VOL	H VOL	% H VOL	Growth (RPI)	Year
1	1	26	83	2	1955	115	11	64	55	1252	52	0	0	12	1990
	2	434	85	2	1965	135	11	66	69	1634	53	0	0	13	1989
	3	31	84	2	1967	334	8	60	100	2033	17	0	0	10.3	1989
	4	26	84	2	1985	124	0	1	0	0	0	0	0	0	1987
	5	34	84	2	1973	476	7	54	111	1886	0	0	0	8.5	1989
	6	32	84	2	1973	534	7	57	126	2299	1	0	0	10.3	1989
	7	20	83	2	1953	223	9	63	80	1747	31	0	0	10	1989
	8	32	84	2	1982	371	4	26	30			0	0	3.5	1987
	9	34	84	2	1982	500	2	10	10			0	0	4.	1987
	10	35	117	1	1945	400	10	60	120	500	60	2000	15	12	1989
	11	11	89	1	1700	8	30	60	20	2155	0	300	98	30	1989
	12	30	84	2	1982	435	2	17	10	0	0	0	0	4	1987
	13	130	119	1	1940	325	9	60	120	1875	35	775	25	12.1	1989
	14	9	85	2	1967	306	9	56	102	1740	23	244	92	11	1989
	15	25	85	1	1950	200	9	60	60	1115	35	310	15	13.2	1989
	16	38	84	2	1964	320	8	60	93	1857	5	0	0	9	1989
	17	20	119	1	1985	350	3	15	20			105	0	10	1989
	18	70	85	1	1940	200	12	60	112	975	62	1500	53	14.7	1989
	19	28	84	2	1958	400	7	60	104	2028	7	0	0	12	1989
	20	33	84	2	1965	420	7	52	110	1825	7	0	0	9.8	1988
	21	16	84	2	1968	266	7	53	72	1237	9	0	0	9	1988
	22	12	85	2	1961	393	7	58	102	1333	3	548	10	11	1989
	23	03	84	2	1972	300	6	50	68	950	0	0	0	10	1989
	24	5	89	2	1700	9	26	50	23	0	0	500	95	20	1989
	25	51	85	1	1960	300	9	60	100	1170	20	750	30	8.5	1989

See key at end of table.

Table B-1
Forest Stand Inventory Data, Naval Submarine Base Kings Bay, Kings Bay, Georgia

Comp	RU	Acres	Cover Code	Origin Code	O Year	Trees per Acre	DBH (in)	Height (ft)	Basal Area	S VOL	% S VOL	H VOL	% H VOL	Growth (RPI)	Year
	26	97	84	2	1967	194	8	55	60	1096	16	58	80	9.2	1988
	27	9	85	1	1964	100	11	60	62	1423	57	75	0	12.50	1989
	28	8	84	2	1968	190	9	48	67	1062	20	75	0	7.1	1988
	29	33	84	2	1970	210	8	57	64	1222	9	0	0	17	1989
	30	180	119	1	1940	200	10	60	50	650	51	775	35	16.8	1989
	31	12	84	2	1960	401	9	72	96	2490	32	0	0	11.7	1988
	32	20	85	1	1952	95	10	46	45	790	41	0	0	13.0	1089
	33	39	84	1	1950	105	11	54	52	423	60	063	40	13.1	1989
	34	34	84	2	1982	484	2	10	10	0	0	55	0	4	1987
	35	81	84	2	1963	308	7	57	80	1474	5	860	0	10.5	1988
	36	6	117	1	1950	190	7	50	46	0	0	675	5	10	1989
	37	58	84	2	1982	430	2	18	9	0	0	0	9	4	1987
	38	11	84	2	1977	400	7	50	92	1600	1	0	0	10	1989
	39	4	84	2	1977	400	6	50	84	1200	0	40	0	8	1989
	40	86	119	1	1940	275	9	60	90	1500	27	320	4	12	1989
	41	4	84	2	1962	606	7	53	140	2330	0	0	0	11	1989
	42	10	84	2	1968	250	6	38	60	1000	0	95	0	8.5	1989
	43	5	84	2	1982	514	3	16	25	0	0			3.7	1987
	44	20	114	1	1900	250	10	50	70	0	0	1300	33	16	1989
	45	5	84	2	1958	220	8	60	62	1265	13			10	1989
	46	18	116	1	1980	0	0	0	0	0	0	1241	0	0	1990
1	**Total**	**1559**													
2	1	3	84	2	1982	416	2	12	9			0	0	4	1987
	2	17	84	2	1972	393	6	40	81	879	0	0	0	7	1989
	3	15	84	2	1948	227	10	59	89	1808	37	0	0	16.5	1989
	4	20	118	1	1958	185	8	60	60	1300	20	0	0	13	1989
	5	53	118	1	1955	170	8	60	53	1068	22	0	0	10.5	1989
	6	24	84	2	1970	400	5	32	55	800	0	0	0	8	1989

See key at end of table.

Table B-1
Forest Stand Inventory Data, Naval Submarine Base Kings Bay, Kings Bay, Georgia

Comp	RU	Acres	Cover Code	Origin Code	O Year	Trees per Acre	DBH (in)	Height (ft)	Basal Area	S VOL	% S VOL	H VOL	% H VOL	Growth (RPI)	Year
	7	20	83	2	1958	277	9	63	96	2103	25	0	0	10	1989
	8	35	84	2	1982	219	2	13	4			0	0	4	1989
	9	5	84	2	1964	321	8	54	91	1622	7	0	0	7	1987
	10	80	84	1	1952	154	11	70	80	1900	45	0	0	14	1989
	11	12	85	2	1956	186	10	64	77	1480	49	191		12	1989
	12	24	84	2	1971	4650	6	50	92	1250	0	0	0	6.5	1989
	13	9	84	2	1956	300	9	66	103	2339	25			12	1989
	14	5	85	1	1950	250	8	60	75	1500	20	5	12	1989	1989
	15	45	119	31	1940	300	9	60	105	1425	42	800	18	16.5	1989
	16	3	84	2	1981	20	1	2							1987
	17	47	84	2	1964	342	7	56	91	1664	1	0	0	14.3	1989
	18	10	84	1	1955	350	8	61	108	2082	24	146	22	12	1989
	19	2	84	2	1950	250	9	65	75	1500	20	0	0	10	1989
	20	8	85	2	1958	270	9	65	97	1911	37	560	18	11	1989
	21	13	119	1	1958	263	8	58	72	181	33	1146	11	10.1	1989
	22	1250	119	1	1950	235	9	60	75	1000	35	561	17	11	1989
	23	16	83	2	1952	180	9	66	70	1611	30	0	0	11	1989
	24	510	85	1	1940	250	8	60	70	1000	20	436	7	9	1989
	25	78	119	1	1940	375	10	60	147	2460	53	825	8	16	1989
	26	10	84	2	1982	400	2	12	8	1096				4.2	1987
	27	44	84	2	1982	500	3	13	23					3.7	1987
	28	9	84	2	1982	545	2	12	11					4	1987
	29	30	84	1	1972	187	7	50	42	694	9	0	0	9	1989
	30	12	84	2	1962	554	7	53	125	2037	2	0	0	11	1989
	31	5	84	1	1980	125	3	13	6	2490				3.5	1989
	32	65	119	1	1940	250	9	60	93	1615	34	375	10	14	1989

See key at end of table.

Table B-1
Forest Stand Inventory Data, Naval Submarine Base Kings Bay, Kings Bay, Georgia

Comp	RU	Acres	Cover Code	Origin Code	O Year	Trees per Acre	DBH (in)	Height (ft)	Basal Area	S VOL	% S VOL	H VOL	% H VOL	Growth (RPI)	Year
	33	10	84	1	1970	290	8	60	80	1600	19	0	0	12	1989
	34	25	81	2	1989	600	2	0	0	0	0	0	0	0	1989
	35	5	89	1	1700	30	22	20	60	43	0	1350	100	20	1989
	36	4	84	2	1968	450	6	38	90	1500	0	0	0	8.5	1989
	37	5	84	2	1982	380	3	15	17	0	0	0	0	3.5	1987
	38	7	84	2	1968	475	8	60	155	3340	10	0	0	10	1989
2	**Total**	**835**													
3	1	3	1	1	1982	0	0	0	0	0	0	0	0	0	1989
	2	11	84	2	1964	487	7	43	113	1404	5	0	0	6.3	1989
	3	3120	84	2	1980	346	3	18	16					3.7	1987
	4	20	84	2	1964	330	7	42	77	941	4	0	0	7.7	`1987
	5	62	84	2	1972	400	7	43	89	1098	1	0	0	7.9	1988
	6	20	84	2	1964	280	7	54	68	1179	2	0	0	10.7	1989
	7	8	85	2	1964	353	7	60	85	1625	6	0	0	10	1989
	8	27	84	2	1980	179	4	17	15			0	0	4.5	1987
	9	48	84	2	1967	344	7	47	80	1135	3	0	0	9.3	1988
	10	15	117	1	1940	280	7	60	76	0	0	1438	8	15	1989
	11	25	84	2	1980	268	4	18	23					4.2	1987
	12	41	117	1	1940	325	8	55	106	0	0	1925	25	15	1989
	13	9	84	2	1964	387	7	57	91	1643	1	0	0	9.7	1988
	14	80	84	1	1955	232	9	60	83	1850	30	0	0	14.3	1989
	15	24	84	2	1964	451	7	56	80	1500	0	0	0	8.5	1988
	16	52	84	2	1981	410	3	15	20					3.5	1987
	17	7	84	2	1981	408	4	15	18	35				3.5	1987
	18	7	84	2	1968	264	8	60	80	1688	10	0	0	13	1989
	19	12	117	1	1946	300	6	50	70	130	0	850	3	14	1989

See key at end of table.

Table B-1
Forest Stand Inventory Data, Naval Submarine Base Kings Bay, Kings Bay, Georgia

Comp	RU	Acres	Cover Code	Origin Code	O Year	Trees per Acre	DBH (in)	Height (ft)	Basal Area	S VOL	% S VOL	H VOL	% H VOL	Growth (RPI)	Year
	20	20	84	2	1964	297	7	43	74	955	2	0	0	9.4	1987
	21	28	84	2	1981	361	3	15	17					4	1987
	22	32	102	1	1940	475	7	116	0	0	1955	20	11	11	1989
	23	3	84	2	1964	336	7	48	88	312	8			9	1988
	24	72	84	2	1981	313	4	18	27					3.5	1987
	25	5	117	1	1955	228	9	60	76	0	0	1695	26	11	1989
	26	5	85	2	1964	351	7	61	82	1595	2	0	0	9	1989
	27	38	84	21	2	1981	285	3	12	13				4	1987
	28	11	117	1	1950	280	6	50	61	0	0	950	0	14	1989
	29	34	84	2	1971	618	6	50	130	1934	0	0	0	5.5	1989
	30	5	117	30	1948	456	8	57	140			2667	25	15	1989
3	**Total**	**744**													
4	1	17	84	2	1964	435	7	45	110	1525	6			8.9	1988
	2	14	84	2	1958	361	7	59	85	1593	6	0	0	12	1989
	3	9	84	2	1964	234	7	48	61	905	6			8	1987
	4	35	117	1	1930	310	7	55	73	0	0	1260	9	20	1989
	5	20	84	2	1981	395	3	13	18					4	1987
	6	6	113	1	1930	300	8	60	50	800	15	1500	20	12.5	1989
	7	16	117	1	1947	353228	8	53	65			1138	18	18	1989
	8	279	84	2	1981	358	4	19	30					3.5	1987
	9	13	84	1	1958	350	8	60	115	2500	16	0	0	14	1989
	10	20	84	1	1950	400	6	50	85	300	0	775	0	14	1989
	11	11	84	1	1945	328	10	62	89	1957	37	425		8	1987
	12	2	84	2	1963	351	8	60	107	2160	5	0	0	12	1989
	13	90	84	1	1955	230	10	65	100	2350	41	0	0	11	1989
	14	4	83	2	1968	350	8	60	100	1900	15	0	0	9.5	1989

See key at end of table.

Table B-1
Forest Stand Inventory Data, Naval Submarine Base Kings Bay, Kings Bay, Georgia

Comp	RU	Acres	Cover Code	Origin Code	O Year	Trees per Acre	DBH (in)	Height (ft)	Basal Area	S VOL	% S VOL	H VOL	% H VOL	Growth (RPI)	Year
	15	6	84	2	1970	502	7	53	116	1892	3	0	0	8.5	1988
	16	20	89	1	1900	169	15	55	88	0	0	1700	70	20	1989
	17	10	84	2	1964	445	8	61	122	2475	9			9	1989
	18	110	83	1	1955	181	11	70	90	2206	50	0	0	10	1989
	19	99	83	2	1953	184	10	67	77	1823	43	0	0	16	1989
	20	13	85	2	1964	238	8	60	64	1275	14	0	0	11	1989
	21	5	85	1	1966	300	7	60	72	1380	4	0	0	9.5	1989
	22	2	84	2	1968	400	8	60	120	2380	10	0	0	8.5	1989
	23	16	84	2	1968	375	7	50	100	1640	0	0	0	8	1989
4	**Totals**	**547**													
5	1	23	84	2	1965	416	7	60	110	2179	0	0	0	12.6	1989
	2	58	114	1	1900	275	9	58	85	0	0	1500	25	15	1989
	3	70	84	2	1981	440	3	15	21					4	1987
	4	87	84	2	1972	506	7	124	1969	0	0	0	0	8.8	1989
	5	15	101	1	1940	300	8	60	105	2215	25	0	0	15	1989
	6	103	84	2	1981	432	3	15	21					4	1987
	7	10	89	1	1700	24	24	60	54	1300	96	0	0	20	1989
	8	9	89	1	1900	60	24	60	75	1350	95	325	45	9	1989
	9	80	89	1	1900	80	18	50	55	810	85	135	50	15	1989
	10	26	81	2	1970	464	8	48	134	2037	15			7.3	1987
	11	98	84	2	1955	301	10	62	107	2302	34	0	0	10	1989
	12	24	85	1	1950	425	7	50	100	575	10	1000	10	7	1989
	13	7	84	2	1980	438	3	15	21					4.2	1987
	14	11	85	1	1967	225	9	65	70	1050	31	400	52	10	1989

See key at end of table.

Table B-1
Forest Stand Inventory Data, Naval Submarine Base Kings Bay, Kings Bay, Georgia

Comp	RU	Acres	Cover Code	Origin Code	O Year	Trees per Acre	DBH (in)	Height (ft)	Basal Area	S VOL	% S VOL	H VOL	% H VOL	Growth (RPI)	Year
	15	65	83	1	1950	200	10	65	90	1160	51	0	0	11	1989
5	**Total**	**686**													
6	1	61	85	1	1950	310	9	60	91	672	26	1030	32	10.0	1989
	2	49	85	1	1953	287	8	57	101	548	15	981	20	12.6	1989
	3	35	85	1	1950	250	7	58	80	1250	10	850	0	12.0	1989
	4	148	85	2	1958	383	8	65	121	2650	12	0	0	12.0	1989
	5	45	84	2	1966	398	7	59	100	1888	2	0	0	12.0	1989
	6	85	85	1	1950	250	7	60	80	1250	15	950	8	14.0	1990
	7	48	84	2	1965	370	9	70	139	2587	50	698	14	12.0	1989
	8	34	84	2	1965	328	8	63	105	2218	14	0	0	9.8	1989
	9	13	113	1	1900	230	7	50	58	0	0	900	15	15.0	1989
	10	18	85	2	1968	390	8	62	120	2550	12	229	10	12.0	89
	11	5	84	1	1983	618	2	10	12					3.0	1990
	12	5	84	2	1958	298	8	62	95	1998	17	0	0	11.0	1989
	13	5	89	1	1800	170	13	50	73	0	0	1200	45	20.0	1989
	14	12	87	1	1700	75	20	60	90	0	0	2000	75	20.0	1989
	15	22	116	1	1920										1989
	16	59	85	1	1940	228	9	56	78	288	4	982	26	13.3	1989
	17	35	85	2	1940	299	8	57	104	1089	15	902	20	10.0	1989
	18	57	85	1	1940	318	9	60	104	720	28	980	28	11.5	1989
	19	22	84	2	1968	339	7	55	98	1789	8	123	3	10.0	1989
	20	12	116	1	1984	0	0	0	0	0	0	0	0	0	1989
6	**Total**	**770**													

See key at end of table.

Table B-1
Forest Stand Inventory Data, Naval Submarine Base Kings Bay, Kings Bay, Georgia

Key:

RU = Locates the stand file in the computer.

Cover Codes:

84 = slash pine.
83 = long leaf pine/slash pine.
99 = no tree cover.
72 = southern scrub oak.
85 = slash pine/hardwood.
69 = sand pine.
89 = live oak.
114 = locally assigned description (eastern) LC: slash pine-titi swamp.
115 = locally assigned description (eastern) LC: slash pine-sand pine/live oak.

Origin Codes:

1 = natural stand with no evidence of artificial regeneration.
2 = stand originating from planted stock.
3 = stand created by seeding.

Origin Year = Year of stand origin. Subtract from present year to get stand age.
Trees per Acre = Number of live trees of commercial species qualifying as desirable or acceptable trees.
DBH = Diameter at breast height in inches.
Height (ft) = Total tree height in feet rather than merchantable height.
BA = Basal area to nearest whole foot.
S VOL = Softwood volume to nearest cubic foot per acre.
H VOL = Hardwood volume to nearest cubic foot per acre.
Growth (RPI) = Average number of rings per inch for the last inch of diameter growth at DBH.

C INRMP Reviews

United States Department of the Interior

Fish and Wildlife Service

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NOV 2 1 2006

Mr. Eric Webb
Environmental Resources Manager
Gulf South Research Corporation
8081 GSRI Avenue
Baton Rouge, Louisiana 70820

Dear Mr. Webb:

Thank you for the Preliminary Final Integrated Natural Resources Management Plan (INRMP) for Naval Submarine Base (NSB) Kings Bay. We have reviewed the plan and find it to be an improvement over the former INRMP for NSB. We believe that Project No. 13 titled, INRMP Review and Revision, should be an on-going solution for NSB, rather than a complete revision every five years. Your willingness to be flexible to change or adjust the project list as conditions vary will save the Navy time and money. NSB has always been diligent in having annual reviews of their INRMP, so this would be a simple way to incorporate changes.

The Fish and Wildlife Service (Service) has the following recommendations regarding the 2006 INRMP:

Forest Management

The Service encourages NSB to continue to convert slash pine plantations to longleaf pine on suitable sites. The rotational age for longleaf should be much longer than for slash pine sites, unless the site index is so poor that it will not sustain the pine. Longleaf stands should not be viewed as primarily for commercial harvesting, since they are slower growing than slash pine. Thinning longleaf stands when they are mature would benefit the trees and the habitat. However, longleaf pines can live into the hundreds of years, providing excellent wildlife habitat, and do not need to be cut.

The Service also recommends that mixed hardwood stands not be put into NSB's standard timber rotation regime. Periodic thinnings for forest health is encouraged and would best be done by single tree selection of species that do not produce wildlife food or are relatively short-lived. Other species, such as oaks, should be allowed to persist to their natural life span. Recent construction projects on the NSB have resulted in the loss of large, mature live oaks, which are

important for neotropical songbird migration stopovers. Allowing oaks to grow beyond the 80 year stand regeneration called for in the INRMP would be definitely beneficial to wildlife.

In Chapter 7, for *Timber/Agricultural areas,* the INRMP states that the timber management intensity will be considered against factors including wildlife considerations (such as corridors) and aesthetics.

Under Project No. 2 titled, Forest Management, the rotational age for hardwoods is listed as 60 years, which is shorter than the 80 year rotational age mentioned elsewhere.

On the stand maps at the end of the INRMP, some of the stand designations do not match up with the keys at the bottom of the maps. Please check and correct as necessary.

Migratory Bird Management

We note that the revised INRMP discusses ways that NSB is exempt from "takings" of migratory birds. According to the INRMP, migratory birds are only protected against "takings" for "normal and routine operations such as installation support functions." It is likely that these activities would occur outside of good migratory bird habitat.

There has been a decline in numbers of species and individuals of migratory birds in the last ten years on NSB. The proposal for migratory bird management in the INRMP is to monitor birds and allow for bird research. This does not constitute management.

Habitat improvements and reducing pesticides would help increase populations, particularly for neotropical migratory birds. We recommend that you use the Service Guidance on the Siting, Construction, Operation and Decommissioning of Communication Towers to benefit neotropical migrants. The area beneath existing tower(s) should be monitored, particularly after foggy nights during migration, to see if the existing tower(s) are causing mortality. If so, towers should be modified in accordance with the Guidelines to reduce the mortality.

Under Project No. 6 titled, Neotropical Migratory Bird Survey, the baseline should be the 1995 survey or earlier, not the 2006 survey. The latter date is not acceptable.

Threatened and Endangered Species

The Natural Resources Management Goals, Objectives and Strategies related to threatened and endangered species are somewhat beneficial, but do not specifically discuss improving conditions for the species. Surveys are appropriate to track and observe what effects management is having on the species.

Under the discussion of manatees, the INRMP states that they are along the coast of Georgia between April and October. We recommend that this wording be changed to reflect when manatees are found in the area of the NSB, which would be from the beginning of April to the end of November.

Under Project No. 11 titled, Gopher Tortoise and Indigo Snake Monitoring and Management, the Service agrees that increased development pressure may be driving federally threatened eastern indigo snakes onto the NSB. However, the Service is concerned that the NSB may be pressured by developers to take their gopher tortoises and put them on NSB. We do not want NSB to become a "dumping ground" for gopher tortoises from other areas. This will lead to disease problems for the NSB tortoises. If there is any unoccupied gopher tortoise habitat on the NSB, it needs to be saved for NSB to use if a NSB security project interferes with gopher tortoise burrows on site. Although the gopher tortoise is not federally listed, the indigo snake relies heavily on the gopher tortoise's burrows and habitat for part of its yearly home range.

Game Management – Waterfowl

The Service advises against creating more open water areas on base for waterfowl management. We believe there are opportunities to manage the spoil sites on a rotating basis to provide waterfowl habitat and other waterbird habitats during migration. We understand that this has to be coordinated with the Dredge Spoil Disposal Operational Procedures.

Recreation

The Service notes the proposal to place a boat ramp for NSB users for recreational boating. The NSB will need to undergo section 7 consultation under the Endangered Species Act for the boat ramp. Because of the increase in recreational boating facilities in the area of the NSB, the Service is concerned about the effects on manatees. An educational program will need to be developed for the boat ramp users on safe boating in manatee habitat.

This concludes our comments on the 2006 NSB INRMP. We look forward to NBS's letter requesting concurrence on federally listed species. We appreciate your attention to wildlife resources in managing your facility. If you have any questions, please call staff biologist, Kathy Chapman, at 912-265-9336 extension 24 or email kathy_chapman@fws.gov.

Sincerely,

Stanley T. Colwell

Sandra S. Tucker
Field Supervisor

cc:
GADNR Nongame/Endangered Species Section, Brunswick, Georgia

D Manatee Protection

NAVSUBASE KINGS BAY INSTRUCTION 11015.1D

Subj: MANATEE PROTECTION MEASURES

Ref: (a) OPNAVINST 5090.1C
(b) Naval Submarine Base Kings Bay Programmatic Biological Assessment for Port Operations and Routine Waterfront Activities
(c) US Fish and Wildlife Service Letter of Concurrence

Encl: (1) Manatee Standards for In-water Construction

1. Purpose. To publish regulations governing manatee protection measures at Naval Submarine Base (SUBASE) Kings Bay.

2. Cancellation. SUBASEINST 11015.1C.

3. Changes. Since this instruction has been revised in its entirety, specific additions, deletions, and revisions have not been marked.

4. Information

a. Reference (a) implements Department of Navy requirements under the Endangered Species Act of 1973, as amended.

b. Reference (b) implemented Endangered Species Act Section 7 Consultation with the US Fish and Wildlife Service (USFWS) relative to manatees and routine SUBASE water related activities. It summarized and consolidated prior years' Section 7 Consultations and updated routine activities taking place in the post-911 working environment.

c. Reference (c) is regulatory agency (USFWS) concurrence that routine SUBASE waterfront activities combined with existing and new manatee protection measures, as identified in reference (b), will most likely not adversely affect manatees or their habitat.

5. Action. All personnel that operate motor vessels or are otherwise involved in water borne activities in the Kings Bay area are required to read and comply with this instruction. Water borne activities specifically include, but are not limited to, deployment/redeployment of Port Security Barriers and In-water Construction/Maintenance/Repair. Enclosure (1) shall be included as a specification or contract specification for applicable activities.

a. As a result of an Endangered Species Act Section 7 Consultation between the Commanding Officer, SUBASE , Kings Bay and the USFWS, contract Tugs and all motor vessels owned and operated by the Navy shall be fitted with manatee guards. Coast Guard operated TPS Screening Vessels are exempt from this requirement however, Coast Guard SOP's implementing additional manatee protection measures identified in reference (b) apply.

b. With the exception of emergency response, all motor vessels, both civilian and military, will operate at idle speeds in the restricted area waters.

c. The shallow cove area on the west side of Crab Island, (east of Marker 62), a known high manatee concentration area, is a NO-ENTRY area for motor vessels.

d. All fresh water pipes and valves shall be maintained in good working order and not leak to prevent Manatees from concentrating in pier areas. Notify the SUBASE Environmental Office in the event of leaky pipes and valves at 573-4678.

e. All personnel who sight a manatee (or sea turtle) will notify SUBASE Port Operations at 573-2550. Report dead sea life using the same criteria below:

(1) Time Manatee/Sea Turtle was sighted.

(2) Number of Manatees/Sea Turtles sighted.

(3) Size of the Manatee/Sea Turtle.

(4) Where Manatee/Sea Turtle was sighted.

(5) What direction the Manatee/Sea Turtle was moving.

f. Port Operations shall report manatee/sea turtle sightings to the SUBASE Environmental Office at 573-4678 and shall maintain a log of manatee/sea turtle sightings.

6. With proper instruction and awareness, we will provide a safe environment for manatees/sea turtles while providing services to requesting activities requiring the safe operation of motor vessels and other water borne activities at SUBASE Kings Bay.

Distribution: (SUBASEINST 5605.1K)
List A, B, F, G, H, I

STANDARD MANATEE CONDITIONS AND PROCEDURES FOR AQUATIC CONSTRUCTION

KINGS BAY SUBASE

The permittee should comply with the following manatee construction conditions for aquatic construction projects conducted in areas in which manatees are known to inhabit:

A. Instruct all personnel associated with the project of the potential presence of manatee(s) and the need to avoid collisions with them. All construction personnel are responsible for observing water-related activities for the presence of manatee(s).

B. Advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatee(s), which are protected under the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973.

C. All vessels associated with the construction project should operate at "no wake/idle" speeds at all times in the construction area. All vessels will follow routes of deepwater whenever possible.

D. Temporary signs concerning manatees should be posted prior to and during all construction/dredging activities. All signs are to be removed by the permittee upon completion of the project. At least two signs measuring at least 3 feet by 4 feet, reading "*Manatee Habitat - Idle Speed in Construction Area*," should be installed and maintained at prominent locations within the construction area/docking facility prior to the initiation of construction. These temporary construction signs should be installed in a prominent location visible to water-related construction crews.

E. Extreme care should be taken in lowering equipment or materials, including, but not limited to, all dredging equipment, piles, sheet piles, casings for drilled shaft construction, spuds, pile templates, anchors, etc., below the water surface and into the river bed; taking precaution not to harm any manatee(s) that may have entered the construction area undetected. All such equipment or materials should be lowered at the lowest possible speed to prevent harm to any manatee(s) that may not have been detected.

F. When siltation barriers are used, care should be taken not to entangle manatee(s). The barriers should be properly secured and regularly monitored to avoid manatee(s) entrapment.

G. All temporary construction materials should be removed upon completion of the work, and salt marsh areas should be restored. No construction debris or trash shall be discarded in the water.

H. For construction activities requiring dredging during the warm season (March 1 through November 30), dredging should be limited to daytime with a professional manatee observer on post and aboard the barge from which dredging is occurring. Nighttime dredging should occur during the cold season months (December 1 to February 28) only. If other times are proposed for nighttime dredging, consultation under Section 7 of the Endangered Species Act with the U.S. Fish and Wildlife Service may be necessary dependent on the project and location.

I. If manatee(s) are seen within 100 yards of the active daily construction/dredging operation or vessel movement, all personnel in the construction area should be alerted. Operation of any equipment closer than 50 feet to a manatee(s) should immediately be shutdown. Activities will not resume until the manatee(s) has departed the project area of its own volition.

Report manatee sightings immediately to Port Services at (912)573-2550 or VHS Channel 74. Port Services will notify the SUBASE Environmental Office at (912) 573-4678. Port Services will immediately notify the Environmental Office of any collisions with and/or injury to a manatee(s). For manatee injuries or mortality discovered during non-duty hours, Port Services will notify the Georgia Department of Natural Resources at (912) 269-7587. Any dead manatee(s) found in water must be secured to a stable object to prevent the carcass from being moved by the current. In the event of injury or mortality to a manatee, all aquatic activity in the project area must cease pending Section 7 Consultation under the Endangered Species Act with the U.S. Fish and Wildlife Service and the lead Federal agency.

J. A log detailing sightings, collisions, and/or injuries to manatee(s) should be kept for that contract period. Following project completion, a report summarizing the above incidents and/or sightings should be submitted to the Contracting Officer who will forward to the Environmental Office.


MANATEE HABITAT
IDLE
SPEED
IN
CONSTRUCTION AREA
1–800–2–SAVE ME


CAUTION
MANATEE AREA
1–800–2–SAVE ME

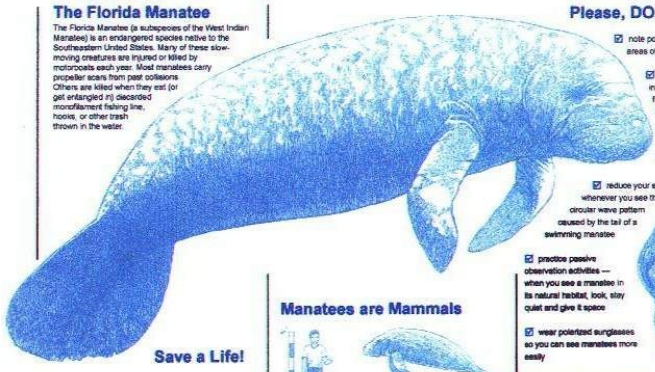
L. Install permanent manatee awareness signs on or adjacent to the dock facility after the work is completed. The signs shall be installed on either end of the face of the facility or on pilings located immediately adjacent to the upstream and downstream end of the dock, in locations clearly visible from the navigation channel. The Georgia Department of Natural Resources (912-264-7218) will assist in correct sign design and placement.

M. Install a permanent "Information Display" sign in a prominent location on the facility within one year of permit issuance. These signs are intended to increase the awareness of the facility users concerning the presence of manatees and of the need to minimize the threat of boats to these animals. The permittee may contact the Georgia Department of Natural Resources (912-264-7218) for additional information and/or clarification on sign installation.

Manatee Basics for Boaters

The Florida Manatee

The Florida Manatee (a subspecies of the West Indian Manatee) is an endangered species native to the Southeastern United States. Many of these slow-moving creatures are injured or killed by motorboats each year. Most manatees carry propeller scars from past collisions. Others are killed when they eat (or get entangled in) discarded monofilament fishing line, hooks, or other trash thrown in the water.



Save a Life!

Report accidental boat strikes to manatees immediately. Please report injured, dead or orphaned manatees, or ones being harassed to the Georgia Department of Natural Resources:

DEPT. OF NATURAL RESOURCES
WILDLIFE RESOURCES DIVISION
GEORGIA

1-800-2 SAVE ME
(1-800-272-8363)
or 1-800-241-4113 after 4:30PM

Manatees are Mammals

The manatee is a large, aquatic mammal that generally grows to 9 - 10 feet long and weighs an average of 800 - 1200 pounds. They can live in fresh, brackish, or salt water habitats, which include Georgia's tidal creeks, rivers and sounds.

Manatees breathe air, just like other mammals. They come up to breathe every two to four minutes, but can stay submerged for 15 to 20 minutes when resting. When a manatee breathes, the nose is usually the only part of the manatee's body that breaks the surface of the water. Remember to look out for manatees when boating in Georgia's waterways.

Manatees are protected by these laws:
The Marine Mammal Protection Act of 1972
The Endangered Species Act of 1973
The Georgia Endangered Wildlife Act of 1973

Please, DO...

- ☑ note posted signs that indicate areas of manatee use
- ☑ slow down — **especially** in water depths of less than five feet and near marinas, docks and boat landings, and posted manatee areas
- ☑ steer your boat clear of manatees
- ☑ reduce your speed whenever you see the circular wave pattern caused by the tail of a swimming manatee
- ☑ practice passive observation activities — when you see a manatee in its natural habitat, look, stay quiet and give it space
- ☑ wear polarized sunglasses so you can see manatees more easily
- ☑ stay in marked channels where the water is deeper

Please, DO NOT...

- ⊘ pass directly over submerged animals if you can avoid them
- ⊘ chase manatees while in a boat or when swimming
- ⊘ operate a boat at high speeds near vegetation at the water's edge
- ⊘ feed or give water to manatees (it may attract manatees to boats, or high boating traffic areas where they are harmed or killed.)
- ⊘ separate or single out an individual from a group or separate a mother from her baby
- ⊘ throw fishing line, hooks, or other trash (such as plastics) in the water

Manatees in Georgia

Season

Habitat

Diet

Reproduction

GEORGIA
THK YOU